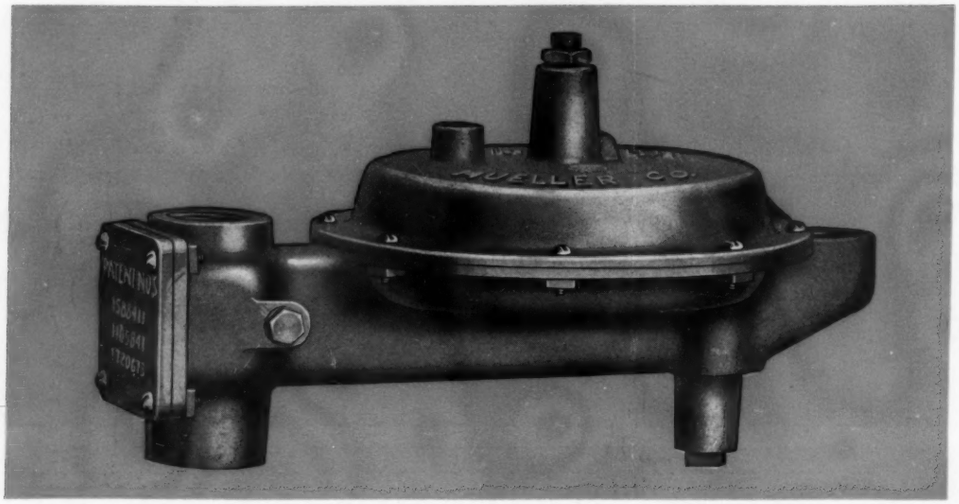
WESTERN GAS

"SMOKELESS CITY" AT THE 1934 CHICAGO WORLD'S FAIR . . . . (SEE PAGE 38)

July 1934 ♦ ♦ 25 Cents



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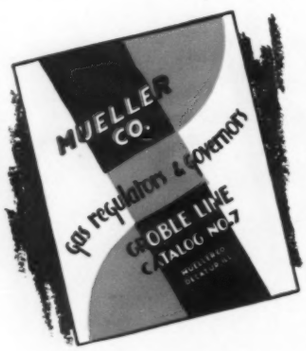
So outstanding is the performance of the Mueller-Groble Service Regulator that we urge every distribution engineer to "try one on your toughest job." Any of our representatives will be glad to cooperate with you in making such a test.



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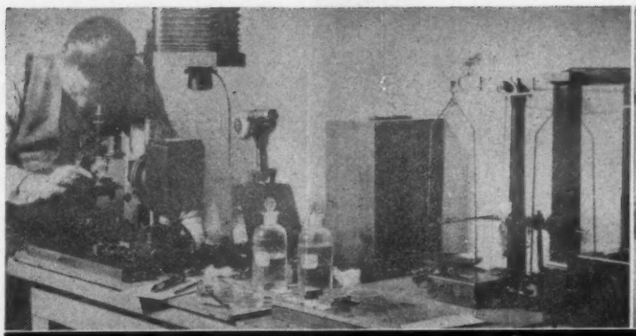

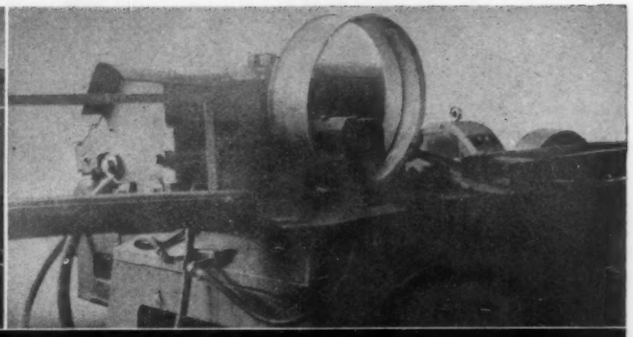

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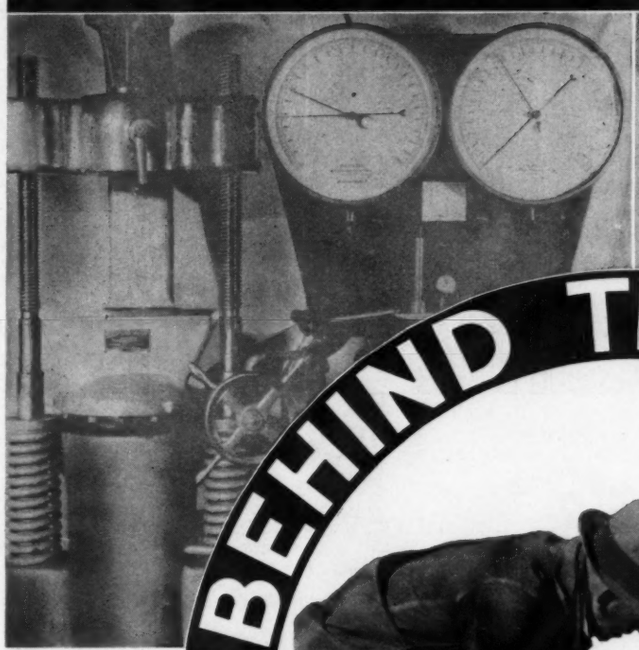

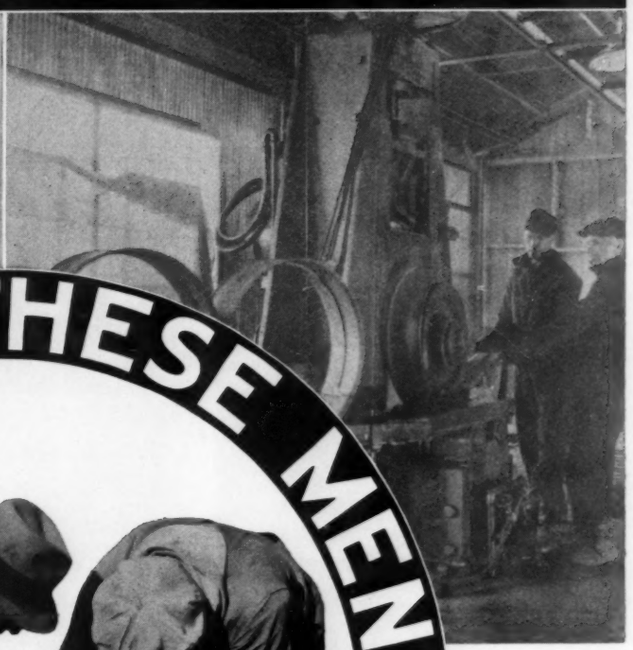

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FACTORY precision guides the hands of the men who install Dresser Couplings . . . . reduces the field work to a few, simple operations that can be performed easily and accurately by even the most inexpert labor.

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July, 1934. Volume X, Number 7. Western Gas is published by Western Business Papers, Inc., at 810 South Spring Street, Los Angeles, California. Subscription price (in advance) 25 cents the copy; $2.00 per year; 2 years, $3.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, under the Act of March 3, 1879.

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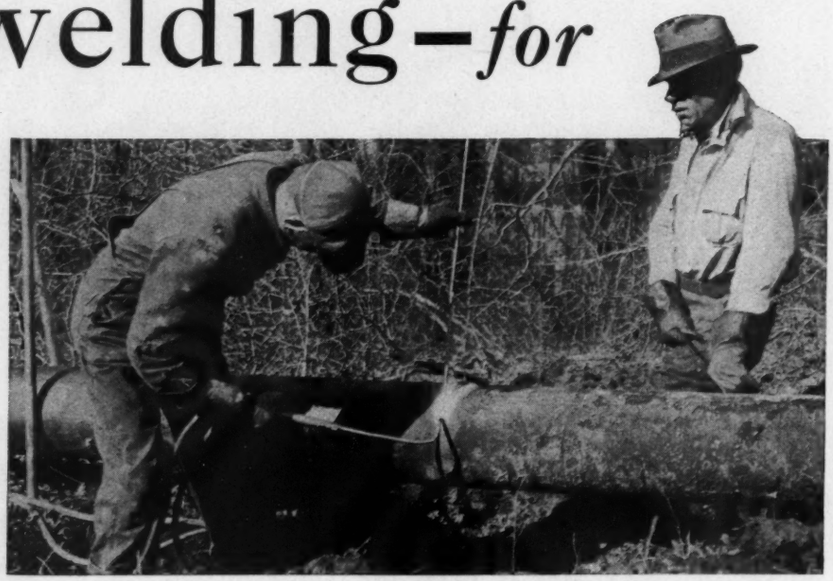

LINDE PROCESS SERVICE has helped many Linde users in reclaiming abandoned pipe lines and relaying the used pipe with welded joints. A recent instance involved the relaying of pipe from an obsolete trunk line into several short gathering lines.

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Pleased with the speed and soundness of the work, officials of the oil company undertook to reclaim usable pipe from many more miles of abandoned systems and to Lindeweld it into new lines. For this work they will continue—as many others do—to order *everything for pipe line welding and cutting from Linde*—in this way assuring the advantages of Linde Process Service.

LINDE PROCESS SERVICE brings to your welding operations the proved results of laboratory research, engineering development, and welding experience which Linde has gained in many years of pipe line work.

Linde Process Service is available to Linde customers. The nearest Linde Sales Office will be glad to tell you how this assistance may be of help to you in your pipe line construction.

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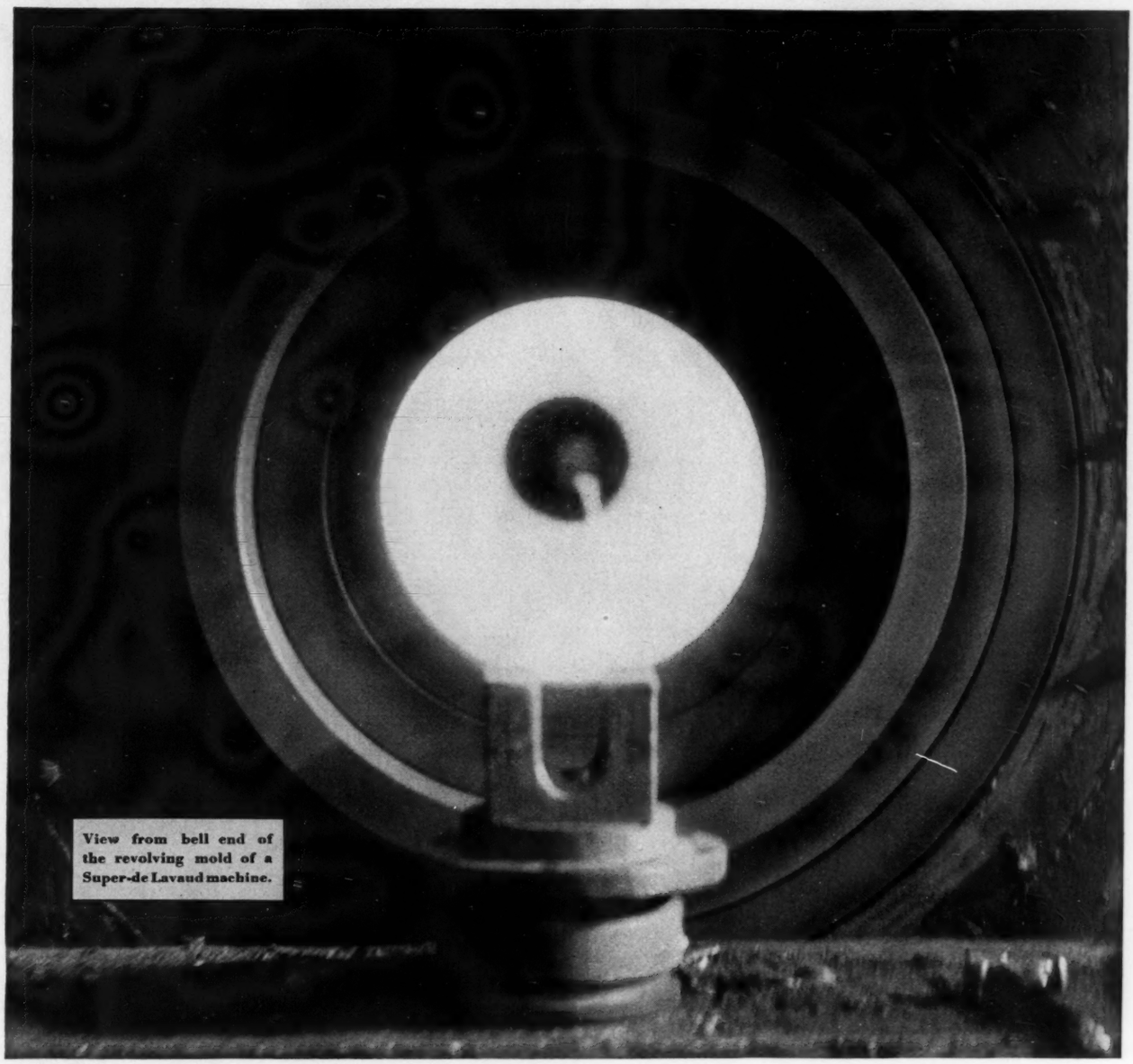
CAST WITHOUT CHILL IN A METAL MOLD



View from bell end of the revolving mold of a Super-de Lavaud machine.

When our technical staff undertook to find a way to cast gray iron against metal without chill there was no precedent to guide them. It had never been done commercially. After literally hundreds of experiments a commercially practicable method was discovered, perfected and patented. Today this method—the Super-de Lavaud process—is standard practice in our plants. Super-de Lavaud Pipe is *cast without chill in a metal mold.* It is stronger, tougher, more ductile. Impact resistance to handling and service shocks is doubled. The pipe does not shatter at failure in bursting tests. These outstanding advantages are obtained by the use of patented processes of centrifugal casting and annealing, described in a book we shall be glad to send on request.

UNITED STATES PIPE AND FOUNDRY CO.
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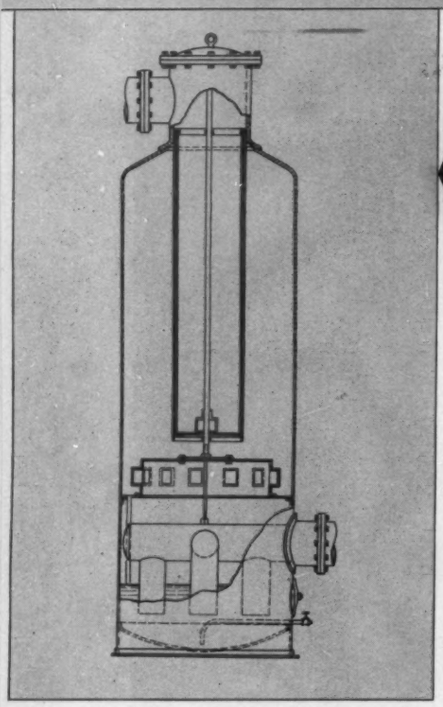
IMPACT RESISTANCE INCREASED MORE THAN 100%

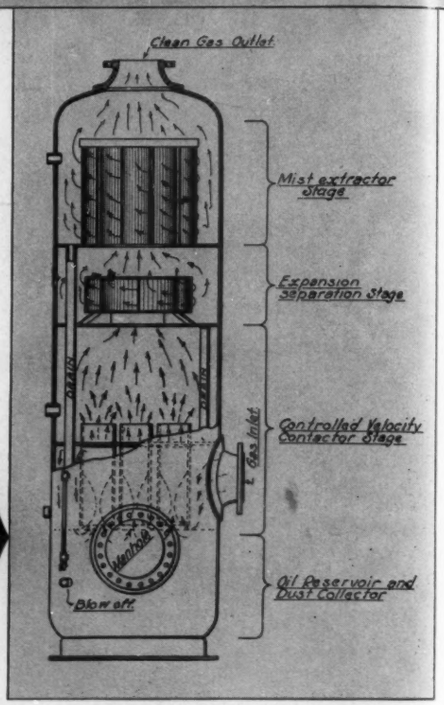
PROGRESS in GAS SCRUBBING



Original Empire Gas Cleaner
Patents Owned by Blaw-Knox Company

The original Empire Gas Scrubber was good at the time because there was nothing better

The development of the present day Blaw-Knox Gas Cleaner from the old Empire fundamentals was the dawn of a new era in Gas Scrubbing



Improved Blaw-Knox Gas Cleaner
(Patented)

ELABORATE and painstaking research and experiment in both field and laboratory, has resulted in the evolution of the Empire Gas Scrubber to the finished and highly perfected mechanism represented by the 1934 Blaw-Knox Gas Cleaner. Blaw-Knox Gas Cleaners offer a profitable investment for the distributor of natural or manufactured gas and the transmission line operator. They insure continuity of service, reduced maintenance and increased customer satisfaction.

Some advantages of the BLAW-KNOX GAS CLEANER

Higher capacity per unit size.

Lower pressure loss at full load.

Pressure loss constant throughout life of equipment. No screen to clean.

Major portion of dust settled and taken entirely out of gas stream.

Practically no oil loss. Large reservoir capacity.

Absolutely non-clogging with large flow areas.

Let us show you specifically what we can do for your conditions.

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BLAW-KNOX GAS CLEANERS

Window display of Hoyt Automatic Water Heaters, manufactured by Hoyt Heater Company, Oakland, California. Note the reference to Everdur Tanks and the cutaway view of an all-welded tank of this rustless metal.

No wonder so many Gas Companies recommend tanks of rust-proof Everdur

CHECK THESE 5 REASONS

✓ They give satisfactory service indefinitely . . . cost the buyer far less in the long run.

✓ They banish rust troubles...require less servicing.

✓ They provide dependable gas consumption, because rust cannot interfere with their performance.

✓ They are readily available . . . leading manufacturers of automatic gas water heaters equip rust-proof models with tanks of Everdur.

✓ They are reasonably priced, because Everdur lends itself to volume production of welded tanks.

For these significant reasons, more and more utilities are pushing the sale of water heaters with *rust-proof Everdur Tanks.* This special Anaconda metal, composed almost entirely of copper, is widely favored by leading manufacturers for tanks of exceptional durability . . . because it combines the corrosion-resistance of copper with the strength and welding properties of steel! May we supply additional data and the list of automatic gas water heater manufacturers using Everdur Tanks?

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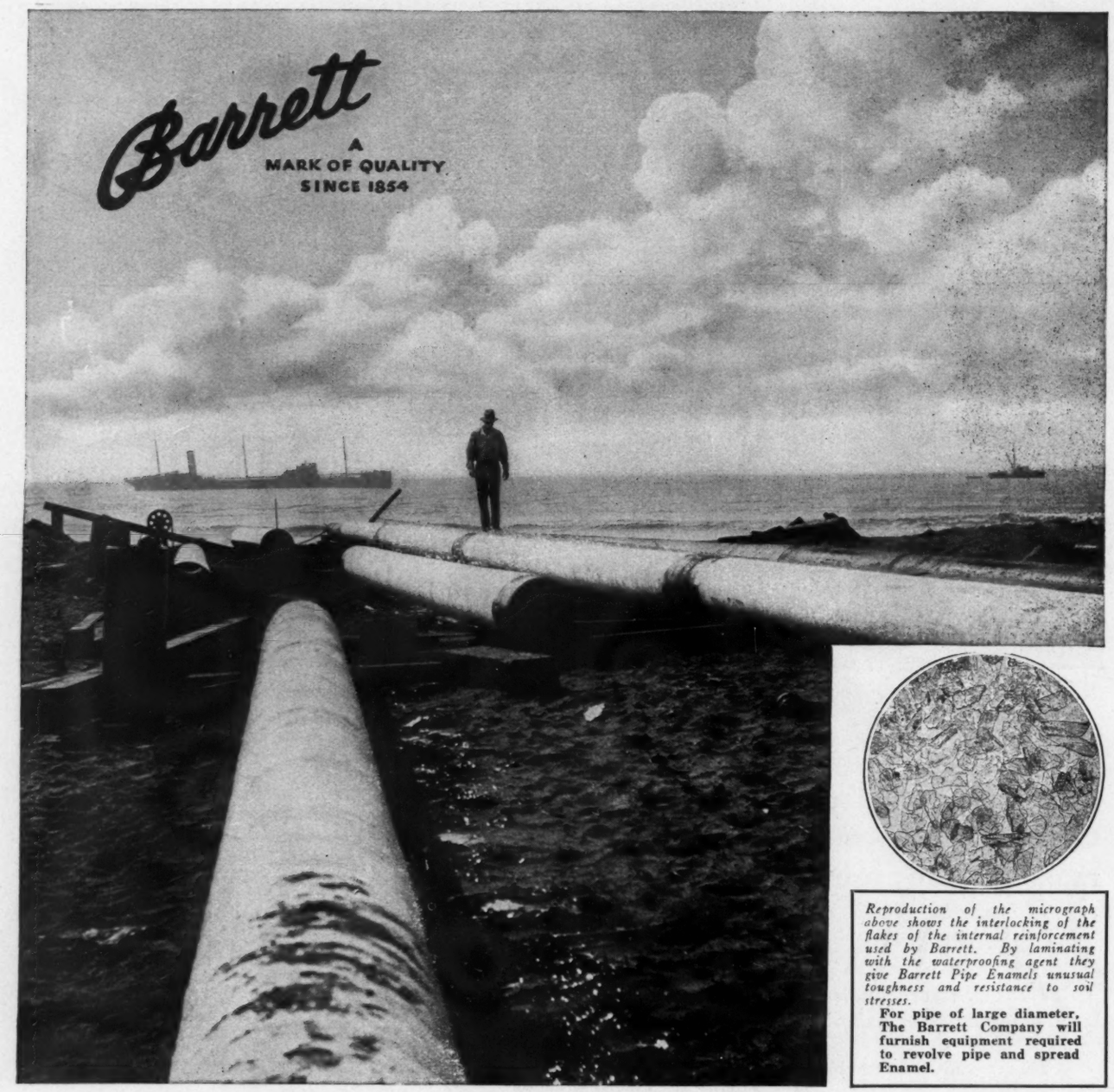
EVERDUR METAL *for* TANKS



Reproduction of the micrograph above shows the interlocking of the flakes of the internal reinforcement used by Barrett. By laminating with the waterproofing agent they give Barrett Pipe Enamels unusual toughness and resistance to soil stresses.

For pipe of large diameter, The Barrett Company will furnish equipment required to revolve pipe and spread Enamel.

PROTECTING a submarine oil-loading line

The protection of a submarine pipe line demands coatings which are strongly dielectric and resistant to salt water action, softening and disintegration from submersion. For this oil line which enables tankers to load at sea, Barrett Pipe Line Enamels were used. Whether the line is underwater or underground, Barrett Enamels applied according to Barrett Specifications, offer the maximum in efficient, trouble-free, expense-free protection. The cooperation of the Barrett Technical Staff, the Barrett Field Engineers is at your service. 'Phone, wire or write.

THE BARRETT COMPANY 40 Rector St., New York, N. Y.

Barrett Specification

PIPE LINE ENAMELS

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WESTERN GAS

"Reg. U. S. Pat. Off."

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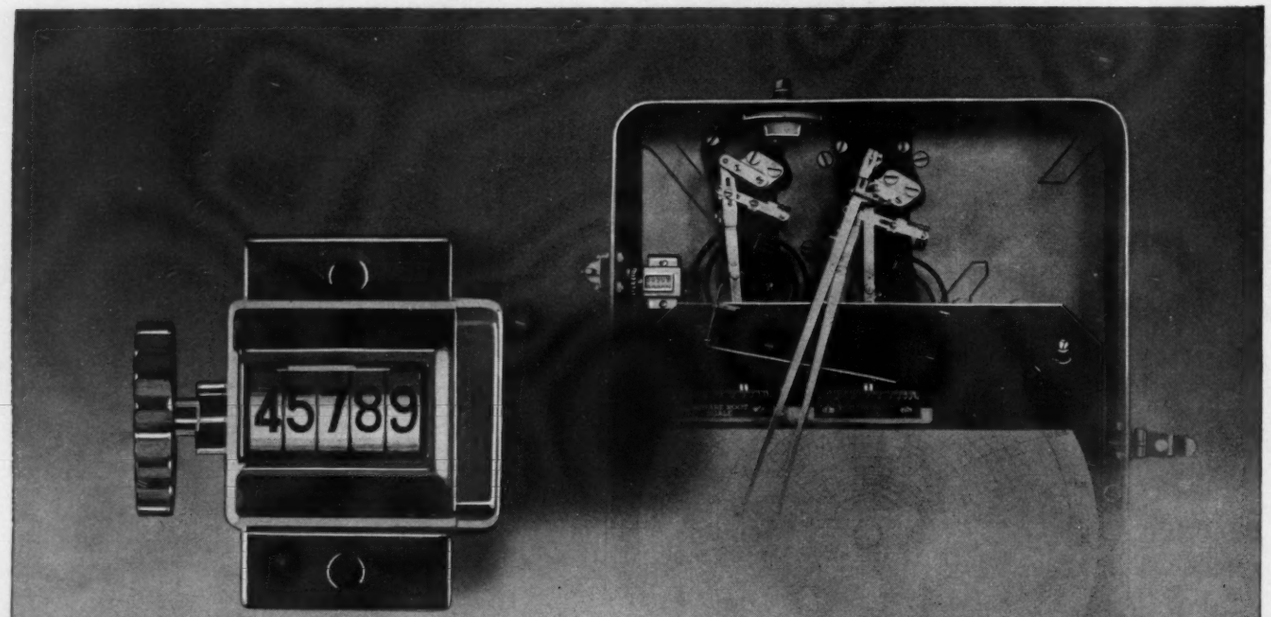

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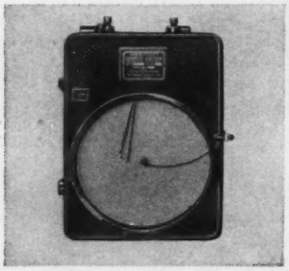

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July, 1934

WESTERN GAS

"Reg. U. S. Pat. Off."

Vol. X, No. 7

A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

Will the Appliance Code be Enforced?

A FEW firms coming under the Gas Appliances and Apparatus Code have been inclined from the first to scout the idea that any real effort would be made to enforce the code. Apparent lack of action from the Code Authority in prosecution of complaints entered since the code went into effect last December has encouraged this small but troublesome element to flout code provisions.

Recent developments in the N.R.A. organization and in the policies of the Code Authority bring reassurance that the industry may expect the promised disciplining of wayward members. In fact, there already has been some action in this direction. Two instances were reported to the June 19th meeting of the Code Authority, held at the Chicago offices of Gas Appliances Institute. One manufacturer has recently been ordered to pay upwards of $25,000 in back salaries, to make up deficiencies in his wage levels. Another manufacturing firm had refused Code Authority representatives admittance to his place of business. This was reported to the N.R.A. with the result that the Code Authority made its investigation under government order, which sets important precedent.

The Compliance Division of N.R.A. is now functioning and the Code Authority may be expected to pass along to it, cases for prosecution where its own facilities fail. Appointment of Col. Cowling, former administrator for the electric manufacturers' code, as deputy administrator for the Gas Appliance and Apparatus Code should also help to lubricate the code machinery, as Col. Cowling has been with N.R.A. from the outset and is thoroughly familiar with procedure.

Recent comments in the press crediting N.R.A. with espousing an "open price policy" have caused some to question price provisions of the Gas Appliances and Apparatus Code. A definite ruling from N.R.A. classifies this code as conforming to the open price policy, since it does not establish uniform prices and merely insists upon prices which are above costs.

Further of interest is the fact that Code Authorities are now dispensing the Blue Eagle insignia, rather than the Post Office. This procedure will more readily limit use of the Code Eagles to those who fully comply with code provisions and who have a record of no complaints filed against them.

With the Blue Eagle for the Gas Appliances and Apparatus Industry administered by the Code Authority for this industry it is more than ever imperative upon gas companies to make certain that their purchases are going to firms duly authorized to use the Code Eagle.

Laboratory Program Moves Ahead

TEN years service to the industry will be completed by the American Gas Association Testing Laboratory in 1935. It would be difficult to overstate the good which the Laboratory program has accomplished in this time. Now, as the program approaches the start of its second decade, comes word of an important policy change which will greatly enhance the value of the Laboratory Seal.

In its general effect the change in Laboratory policy will limit approvals on appliances and accessories to a five-year period, subject to annual retest. At present there is no time limit upon approvals. From now on, every five years the appliances must be revised to meet the applicable current standards, in order to retain approval. This, of course, does not imply complete retesting; in most cases merely inspections or partial tests will be called for.

Details of the new policy, which takes effect January 1, 1933, are summarized on another page of this issue. It will be noted that all appliances approved prior to January 1, 1931, must be made to comply with the pertinent standards in effect on next January 1, in order to have approvals renewed.

The Embattled Northwest

PACIFIC Coast Gas Association's Northwest Conference at Portland last month gave delegates a stimulating insight into how Northwest gas men react to their much-talked-about competition. The impression is that they have their sleeves rolled up and are making considerable of a showing. In fact the burden of defense seems to have shifted to electricity in several Northwest sections.

Justice cannot be done the excellent P.C.G.A. conference in this space; it is reviewed in other pages, and several of the program features also appear in this issue.

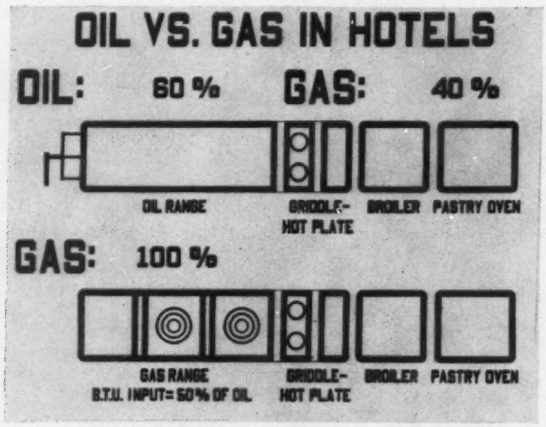


Fig. 1. Possibilities for gas use in hotels.

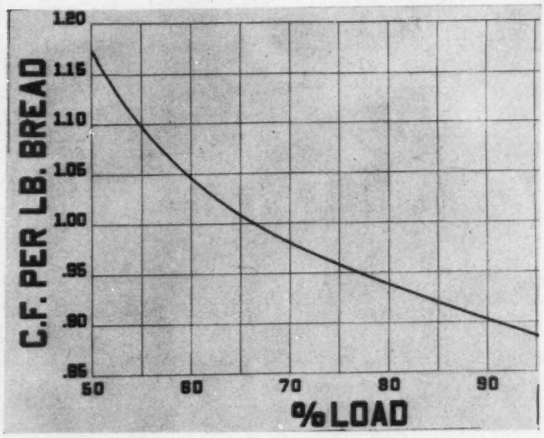


Fig. 2. Load curve for traveling ovens.

Commercial Cooking and Baking

MR. MILLER'S remarks introduced a general discussion on the above subject before the Pacific Coast Gas Association's Northwest Conference, held June 21-22 at Portland, and were designed to stimulate discussion of the important factors, namely, selection of appliances; the potential value of gas-fired auxiliary equipment in connection with oil-fired major appliances; the importance of a careful survey of a customer's needs prior to the installation or selection of appliances; the importance of working with a customer to the end that the stand-by period might be reduced to a minimum.

C. R. Miller

Mr. Miller voiced the thought that the questions and problems confronting the several western utilities in this range of endeavor were essentially the same; he further suggested that a properly organized Association committee, utilizing *Western Gas* or Association bulletins, could pool information that would be of immense benefit to those specifically interested in promoting the usage of gas for this particular portion of our load.—*Editor.*

GAS for commercial cooking and baking, beyond a doubt, remains the most satisfactory fuel for the purpose. As a fuel, it leaves little to be desired from a handling standpoint. It has several very important characteristics in its favor; namely, a uniform quality, convenience, cleanliness, susceptibility to the most sensitive control, coupled with an inexhaustible supply at all times.

By C. R. MILLER

Superintendent of Utilization
Portland Gas & Coke Company

The items which tend to discourage the use of gas in most cases resolve themselves into a relatively high fuel cost on one hand, and old, inefficient or unsuitable appliances on the other. The cost of fuel is the item all too frequently overemphasized in the mind of the commercial baker, hotel or restaurateur, irrespective of the fact that the fuel item amounts, generally speaking, probably not to exceed 1½ per cent of the total operating expenses of such industries. (Table No. 1 sets forth the main items of restaurant operating cost.)

The fact remains, however, that if the monthly gas bill amounts to $50, a representation on the part of an enthusiastic oil salesman quoting $25 for the same fuel service, will find a very attentive ear.

TABLE NO. 1. RESTAURANT OPERATING COST, AVERAGE, BY PERCENTAGE

Meal Costs Restaurants—Hotels	30c Meal %		50c Meal %
Commissary	45	to	50
Wages	30	to	25
Rent	8		8
Laundry	2		2
Gas	1		1½
Light and Power	2		2
Insurance, Repairs, etc.	1		1
Profit	P & L		P & L
Total	100%		100%

We of the gas industry realize the many advantages of gas and the relatively low upkeep on gas appliances. We are also familiar with the fact that the upkeep and fixed charges on oil installations are considerably higher than those charges with gas. But these intangibles are very hard to explain in an understandable and acceptable way to the operator who is having a hard time to make both ends meet, and a large percentage of operators fall under that heading at the present time. Taking the oil man's word for it, the operator can easily visualize the $25 fuel saving, and frequently prefers to trust to luck regarding other matters of expense.

There is much to be said about appliances and much saving to be made, particularly in the commercial cooking field, if proper studies and plans are formulated with respect to individual needs. Here gas comes into its own if we but take advantage of the opportunity and properly utilize the flexibility of operation afforded by gas.

I am going to show in a hypothetical case illustrated by a rough sketch (see Fig. 1) some of the possibilities of gas in a hotel. Let us consider a case in which gas may be used in competition with diesel oil. It is apparent in the case of an oil range installation that there must be a certain amount of auxiliary equipment employed; this often falls to the lot of gas. The auxiliary appliances are usually in the form of pastry ovens, broilers, hot plates, small griddles, etc. It is self-evident that an oil heated range is not suitable for pastry baking or broiling, or for a great deal of the lighter frying and the other light work; for example, the preparation of breakfast cereal may be done much more

(Continued on Page 31)

Gas Is *Cheaper!* . . . . We Can *Prove* It

By J. EARL JONES

Commercial Manager
Seattle Gas Company

SERVING manufactured gas in the nation's hottest electric competition belt, Seattle Gas Co. has seen the wisdom of talking facts as opposed to generalities, on local comparative fuel costs. How the facts were obtained, and what use is being made of them is the burden of this paper, prepared by Mr. Jones and read by Jas. F. Pollard, vice-president and general manager of the Seattle Gas Co., at the Portland sessions of the Pacific Coast Gas Association, June 21-22. —*Editor.*

● Front side of "proof card" carried by Seattle Gas Co. salesmen and Business Builder employees—a replica of billboard copy used in "Gas Is Cheaper" campaign. Supporting data on comparative costs of gas and electricity are conveniently summarized on opposite side.

IT IS generally conceded by gas men that gas cooking offers many distinct advantages over electricity. There need be no hesitation in claiming (a) lower purchase price, (b) less operating cost, (c) greater adaptability, (d) higher speed, (e) smaller maintenance, (f) equal or better quality of cooked food, (g) equality in beauty, convenience and cleanliness. But do general claims such as these or quotations from outside authorities, crystallize into definite sales of gas ranges? Isn't it better to carefully analyze your local situation and attack it in its most vulnerable point with positive proof based upon local tests and conditions?

J. Earl Jones

Great battles were never won through defensive measures alone. The gas industry has spent altogether too much time in trying to justify its position and explaining why gas is as good as other fuels. Isn't the time right to step out boldly into the front rank and offer incontrovertible proof that gas cooking is better than electricity? Is it not equally important to concentrate one's efforts on a single objective in a given campaign in order to accomplish satisfactory results?

The Seattle Gas Co. perhaps faces the strongest electric competition of any city in the United States, with two very aggressive power companies as competitors and one of these municipally owned. After making a careful study of the local situation, it was determined that proof was needed to establish the company's claims for greater speed and lower operating cost of gas compared to electricity for cooking and storage water heating in Seattle.

Reliable information was not lacking from outside sources showing the relative speed and cost of gas vs. electricity. Extensive tests have been made by the A.G.A. Laboratory, range and water heater manufacturers, gas companies and colleges—but all these lacked the local color and application to convince the company's salesmen, employees and customers, that gas was faster and cheaper than electricity. To establish this proof the Seattle Gas Co. made its own tests at considerable expense and effort. The head of the Home Economics Department of the Ellensburg State Normal School was engaged during the summer vacation months to conduct the cooking tests. An unoccupied apartment was selected for the laboratory. The latest type fully automatic well known make of electric range was purchased from a local utility. Likewise, the very latest and most modern gas range was set up for testing purposes. Both ranges were equipped with close registering meters on fuel consumption. Scales and measuring devices were provided for carefully checking the food supplies.

The home economics director secured two able assistants, both home economics graduates, and assigned one girl to each range to work separately and independently of each other to get the best possible cooking results from each appliance. The director then laid out duplicate menus for 42 meals representing three meals per day for a period of two weeks to take care of a family of five people. Exactly the same amount of food, weighed to the nearest gram, was cooked on each range simultaneously during the entire process. The exact time intervals and fuel consumption were recorded.

As a result of these practical and scientific tests it was found that gas was 33 per cent faster than electricity for actual meal preparation. For fuel consumption it was established that 1.4 kw. hrs. were required to do the same work as 1 unit of gas. (1 unit of gas is equivalent to 10,000 B.t.u.'s or 20 cu.ft. of 500 B.t.u. gas).

Corresponding tests were also made by the head of the Physics Department of the University of Washington to determine the relative fuel requirements in gas and electricity for storage water heating. The latest and most efficient models of well known makes in electric and gas storage water heaters were selected for testing purposes. Approved recording instruments were used and careful and accurate records kept on all tests made.

(Continued on Page 40)

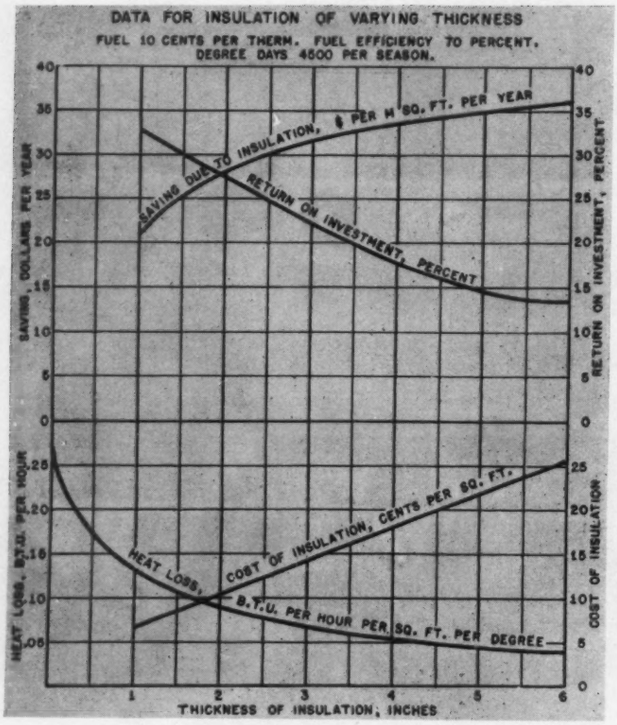

DATA FOR INSULATION OF VARYING THICKNESS
FUEL 10 CENTS PER THERM. FUEL EFFICIENCY 70 PERCENT.
DEGREE DAYS 4500 PER SEASON.
SAVING DUE TO INSULATION, $ PER H SQ. FT. PER YEAR
RETURN ON INVESTMENT, PERCENT
HEAT LOSS, B.T.U. PER HOUR
COST OF INSULATION, CENTS PER SQ. FT.
B.T.U. PER HOUR PER SQ. FT. PER DEGREE
SAVING, DOLLARS PER YEAR
RETURN ON INVESTMENT, PERCENT
COST OF INSULATION
THICKNESS OF INSULATION, INCHES

Fig. 1.

Heat Conservation in Gas

By THOMSON KING

*Consolidated Gas, Electric Light and Power Co., Baltimore, Md.**

THE importance of our subject is obvious and explicit. Heating is only necessary because of heat loss. Conservation is essentially the reduction of loss and waste to a minimum. The quantity of gas or any other fuel necessary to heat any structure will be determined by two things: the difference between inside and outside temperatures, and the heat loss per degree of difference. The first is determined by the weather and the inside temperature it is necessary to maintain, and the second by the material and construction of the structure and the manner in which it is used. All these factors, with the exception of the weather, are subject to variation and control by us.

It will be the object of this report to consider the more important and practical measures of heat conservation in gas heated structures, and it is our intention to deal with the economic rather than the strictly technical aspect of the question. There is, we believe, plenty of data available on the insulation value of building materials and similar subjects; it seems that there is, however, a need for study of the economic aspect of the problem. Results should be presented and interpreted so that they may serve as a guide for all who are interested in conserving fuel and reducing costs. They should indicate clearly what measures should be used and how far they should be carried to secure results that will justify their adoption by yielding a satisfactory return on their cost.

The heat loss from any structure may be divided into: losses due to heat conduction and radiation and losses due to air change. There is an essential difference between these classes. We may reduce the first as far as we like although there is a practical limit to how far we should go. But since a certain amount of air change is necessary to health and comfort, there is an absolute limit to the reduction of losses due to air change in any occupied building beyond which we must not go even if we are able. It is evident that for any structure, there is a necessary heat loss which we cannot seek to reduce. All other losses may be reduced as far as the savings justify the expense. It is our problem to investigate and discuss the ways and means, and find out how far each may be profitably carried.

Before beginning a detailed consideration of conservation measures, it may be well to point out that we have found it convenient in dealing with our problems to use the therm as a common unit in which to express heat requirements, heat loss, or heat saving and heat value in fuels; also, that expressions such as the following are useful in illustrating the relations between quantities with which we are dealing.

Let D = the normal degree days.

Let C = the cost of the fuel, dollars per therm.

Let E = the average overall efficiency of the heating plant for the heating season; e.g., the B.t.u. delivered to the house divided by B.t.u. in fuel fired.

Let H = the total heat loss per day per degree difference in temperature expressed in therms.

Let H_s = the saving in heat per day per degree difference in temperature for any given conservation measure expressed in therms.

Let I = the cost of the insulation or other heat conserving measure in dollars.

Some of the relations between these factors are expressed by the following simple formulas:

Heat requirements per season = HD Therms

Heat necessary in fuel for season $= \frac{HD}{E}$ Therms

Cost of fuel for season $= \frac{HCD}{E}$ Dollars

Heat saving per season due to any measure $= H_sD$ Therms

Saving in fuel per season $= \frac{H_sD}{E}$ Therms

Saving in money per season $= \frac{H_sDC}{E}$ Dollars

Return on money invested in any measure for heat conservation $= \frac{H_sCD}{EI}$

*Second in a series of articles sponsored by the American Gas Association House Heating and Cooling Committee, C. A. Nash, chairman. The author is chairman of the Sub-committee on Heat Conservation.

It is evident that the savings possible with any conservation measure varies directly as the cost of the fuel and the degree days, and inversely as the overall efficiency of the application of the fuel. The curves of Figs. 1 and 2 illustrate this in graphic form.

Broadly speaking, the more important measures for heat conservation fall under the following heads:

Reduction of Inside Temperatures
Insulation

Heated Buildings

Weatherstripping and Caulking
Double Windows.

In order to discuss and evaluate the practical results to be obtained, it will be well to have a fairly typical house to use as an illustration.

Let us take a two story separate dwelling of fairly good frame construction, shingle or clapboard outside, slate roof, with unfurnished, unheated attic. Horizontal cross section 30 feet by 24 feet inside, ceiling height first floor 9 feet, second floor 8 feet. Total contents not including basement or attic 12,960 cu. ft. Let us assume this house to be uninsulated with double hung sash windows, single glass not weatherstripped. It has a hot water heating system with plain type thermostat.

Table No. 1 gives the heat losses data, including areas, conductance coefficients used, and infiltration data for average conditions of 7-mile wind and maximum day with 20-mile wind.

The figures for infiltration losses and savings to be obtained by weatherstripping are based upon an assumption that the house will have 382 linear feet of crack around doors and windows, and that with the 7-mile per hour wind, no weatherstripping, infiltration is 12.5 cu. ft. per foot of crack per hour; with weatherstripping 8.8. For a 20-mile wind with no weatherstripping infiltration is taken as 59.3 cu. ft. per foot of crack per hour, while with weatherstripping this figure is reduced to 35.5.

In estimating the saving due to double windows and storm doors, we have assumed a saving in infiltration losses the same as for weatherstripping, plus a saving based on the conductance for the glass area being reduced from 1.13 to .55 B.t.u.'s per square foot per degree per hour. The glass area is assumed to be 311 square feet..

The method of figuring floor loss is possibly open to some criticism, but is adopted here for the sake of simplicity.

Let us assume that our house will be heated by a gas boiler with gas costing 10 cents per therm, and that the average degree days for the locality are 4,500. Then D = 4,500 and C = .1. We will assume that E = 70 per cent, which is a very conservative figure, even including the spring and fall heating when overall efficiency is necessarily very low. From Table No. 1, H = .32280.

Then, the total heat requirements per season =

$$.32280 \times 4500 = 1452.6 \text{ Therms}$$

The heat to be supplied by the gas will be:

$$\frac{145.2}{.70} = 2074.3 \text{ Therms}$$

The cost per season will be $207.45 for the house as set up without any particular attempt at heat conservation.

We are now ready to study the possible heat savings. Table No. 2 shows the cost of various conservation measures both gross and net, the saving in heat, the saving in operating costs and the return on the gross and net costs. Now with the concrete example before us we can discuss each saving and endeavor to show what return we may expect it to yield upon the money invested in it.

It is first necessary to point out that the return on our investment in many cases depends upon whether we plan for the conservation measure before the house is built or adopt it later. If we know we are going to use insulation, we can install a smaller boiler and less radiation and deduct the saving on heating plant from the cost of insulation, arriving at a net cost much lower than the gross cost of the insulation. If, however, our plant is already installed, we cannot recover anything on the excess capacity that will exist after insulation is put in, and we must calculate our return on the gross cost of insulation or whatever other conservation measure we are considering.

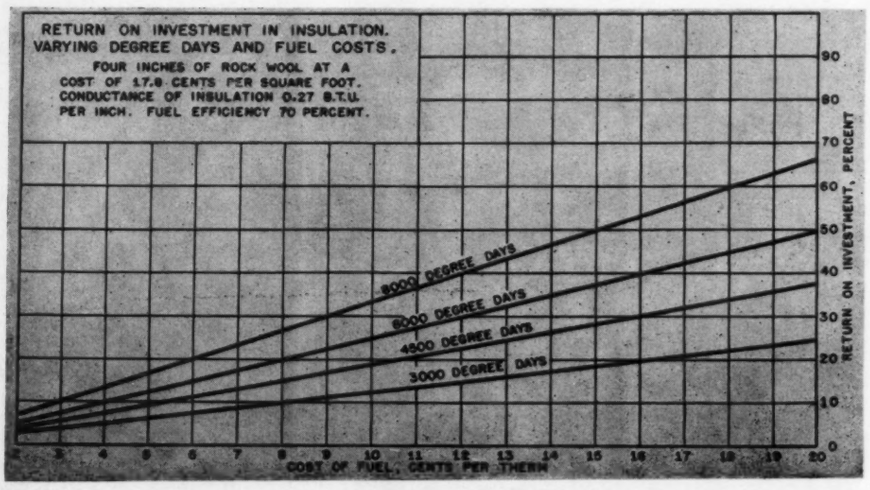

RETURN ON INVESTMENT IN INSULATION. VARYING DEGREE DAYS AND FUEL COSTS.
FOUR INCHES OF ROCK WOOL AT A COST OF 17.8 CENTS PER SQUARE FOOT. CONDUCTANCE OF INSULATION 0.27 B.T.U. PER INCH. FUEL EFFICIENCY 70 PERCENT.
9000 DEGREE DAYS
6000 DEGREE DAYS
4500 DEGREE DAYS
3000 DEGREE DAYS
RETURN ON INVESTMENT, PERCENT
COST OF FUEL, CENTS PER THERM

Fig. 2.

Temperature Set-back at Night

The question of the saving that can be effected by using a clock thermostat or timer to lower the temperature carried during the night hours has long been debated. Many words have been wasted and much ink has been spilt by each side of the controversy. There is a fairly general agreement that there is a saving. The question has been whether the saving that could be obtained was enough to justify the extra cost and complication introduced by the use of the clock. We believe that enough reliable data has now been collected to prove that, except in the case of very cheap fuels, the set-back is decidedly worthwhile.

The saving is due not only to maintaining a lower temperature for six or eight hours out of the 24, but also to the fact that on steam, vapor and hot water

TABLE NO. 1. HEAT LOSS DATA TYPICAL HOUSE UNINSULATED

Conduction Losses

	Area Sq. Ft.	Heat Conductance	Loss per Degree Per Hour B.t.u.	Loss per Degree Per Day B.t.u.	Loss per Degree per Day Per Cent of Total	Loss Maximum Hour B.t.u.	Loss Maximum Hour Per Cent of Total
Glass	311	1.13	351	8,424	26.1	24,570	22.9
Walls (Net)	1,633	.262	427	10,248	31.8	29,890	27.8
Roof	720	.280	201	4,824	14.9	14,070	13.1
Floor*	720	.34	245	5,880	18.2	4,900	4.5
TOTALS			1,224	29,376	91.0	73,430	68.3

*20° constant temperature difference between first floor and basement, is used in floor loss figures.

Infiltration Losses

	Average Condition—7-mile Wind				Maximum Conditions—20-mile Wind				
	Volume Cu. Ft. per Hour	Loss B.t.u. per Degree per Hour	Loss B.t.u. per Degree per Day	Loss per Degree Day Per cent	Volume Cu. Ft. per Hour	Loss B.t.u. per Degree per Hour	Loss B.t.u. per Degree per Day	Loss Max. B.t.u.	Hour Per cent of Total
Windows and Doors	4,750	95	2,280	7.1	22,530	450.6	10,814	31,542	29.4
Walls, Roof, Floor	133	2	48	.1	524	10.5	252	735	.7
Opening Doors and Windows	1,200	24	576	1.8	1,200	24.0	576	1,680	1.6
TOTALS	6,083	121	2,904	9.0	24,254	485.1	11,642	33,957	31.7
Total Conduction and Infiltration Losses			32,280			1,709.0	41,018	107,387	

TABLE NO. 2. SUMMARY OF POSSIBLE HEAT SAVINGS TYPICAL HOUSE

	First Cost Gross (Dollars)	Savings (B.t.u.) Max'm Hour	Savings (B.t.u.) Per Degree Per Day	Saving (% of Total) Max'm Hour	Saving (% of Total) Degree Per Day	Saving in Htg. Plant Cost (Dollars)	Net First Cost (Dollars)	Gross Annual Saving Oper'ng Cost (Dollars)	Annual Deprec'n Oper'ng Expense (Dollars)	Annual Oper'ng Saving (Dollars)	Return on Net Inv'stmt (%)	*First Cost (Dollars)	*Return on Gross Cost (%)
Clock on Thermostat	20.00	.....	.....	.....	7.5	.....	20.00	16.03	2.40	13.65	68.	20.00	68.
Weatherstripping	100.00	12740	672	11.8	1.6	69.00	31.00	4.40	0.00	4.40	14.	120.00	3.7
Double Windows and Storm Doors	100.00	25368	4982	23.6	12.1	121.00	—21.00	35.25	13.00	22.25	.....	120.00	18.5
Insulation in Walls, No. 1	196.00	22540	7728	21.	18.9	107.00	89.00	51.14	0.00	51.14	57.	260.00	19.6
Insulation in Walls, No. 2	260.00	12810	4490	12.	14.0	61.00	199.00	30.00	0.00	30.00	15.	.....	.....
Insulation in Roof No. 1	86.00	10584	3629	10.6	11.2	51.00	35.00	24.00	0.00	24.00	68.6	115.00	20.9
Insulation in Roof, No. 2	115.00	6050	2073	5.6	6.4	30.00	85.00	14.00	0.00	14.00	16.5	.....	.....

*In House already built with no saving in heating plant.
Insulation No. 1—4 inches rock wool—cost if placed when house is built 12 cents per sq. ft. Cost if blown in later 16 cents per sq. ft. Conductance .27 B.t.u. per sq. ft. per degree per inch.
Insulation No. 2—A board insulation 1 inch thick, used as plaster base costing 16 cents per sq. ft. Conductance .34 B.t.u. per sq. ft. per degree per inch.

systems, the occupants of the house leave their radiators on and open their windows while sleeping. Therefore, if the thermostat is left at the day temperature, shortly after the people have retired it will call for heat. The radiators in the bedrooms with open windows will be filled with steam or hot water, resulting in a very high rate of heat dissipation and the heat so rapidly dissipated will immediately escape through the windows. We believe that the conclusion that a very substantial saving can be secured by the set-back is inescapable, and that the best data available indicates that a conservative estimate of the average saving for steam and hot water installations, due to a proper set-back, is at least 7.5 per cent of the total gas that would be burned if the set-back were not used. This figure has been used in our calculations. It is possible that, for warm air systems, the saving is somewhat less.

The question of how great a set-back will yield the best results is also one that has been hotly debated. It will differ somewhat for different sypes of buildings and different climates. For the average conditions we are using in our illustration, we believe a set-back of 10 to 12 degrees gives the best results.

It is evident that a set-back at night cannot reduce the maximum hour's demand for heat. It is possible to argue that it might increase the rate at which heat would have to be supplied when bringing the temperature up in the morning and would, therefore, increase the size of the heating plant. We do not believe, however, that it is general practice to vary the size of boiler and radiators installed with regard to whether a clock type thermostat is to be used or not.

On the basis of a $20.00 extra cost for a clock type thermostat and 7.5 per cent saving in fuel with gas at 10 cents a therm, and after allowing for maintenance and depreciation on the clock, we have the very handsome return on our investment of 68 per cent, which is by far the greatest proportional saving that any of the heat conservation measures will yield.

Weatherstripping

The question of the efficacy of weatherstripping has, also, been very much discussed. There still remains a considerable amount of uncertainty in the data about window leakage. It is not within the scope of this report to attempt to discuss the final accuracy of such data or to deal with the technique of calculating such losses. There are, however, several points that we have not seen stated clearly in any of the literature on the subject and which it may be worth while to attempt to demonstrate here.

If we refer to the data presented in the 1933 Guide, published by the A.S.H.V.E., we see that the saving of infiltration loss around window sash, due to weatherstripping, is much greater in proportion for the higher wind velocities. The saving for a 20-mile wind is more than four times as great as that for a 5-mile wind. In estimating the maximum heat requirements for any structure, we believe that infiltration losses should be based on the 20-mile wind. These maximum losses will determine the size of boiler and radiation to be installed. In estimating the fuel requirements for the season, we must deal with average infiltra-

(Continued on Page 32)

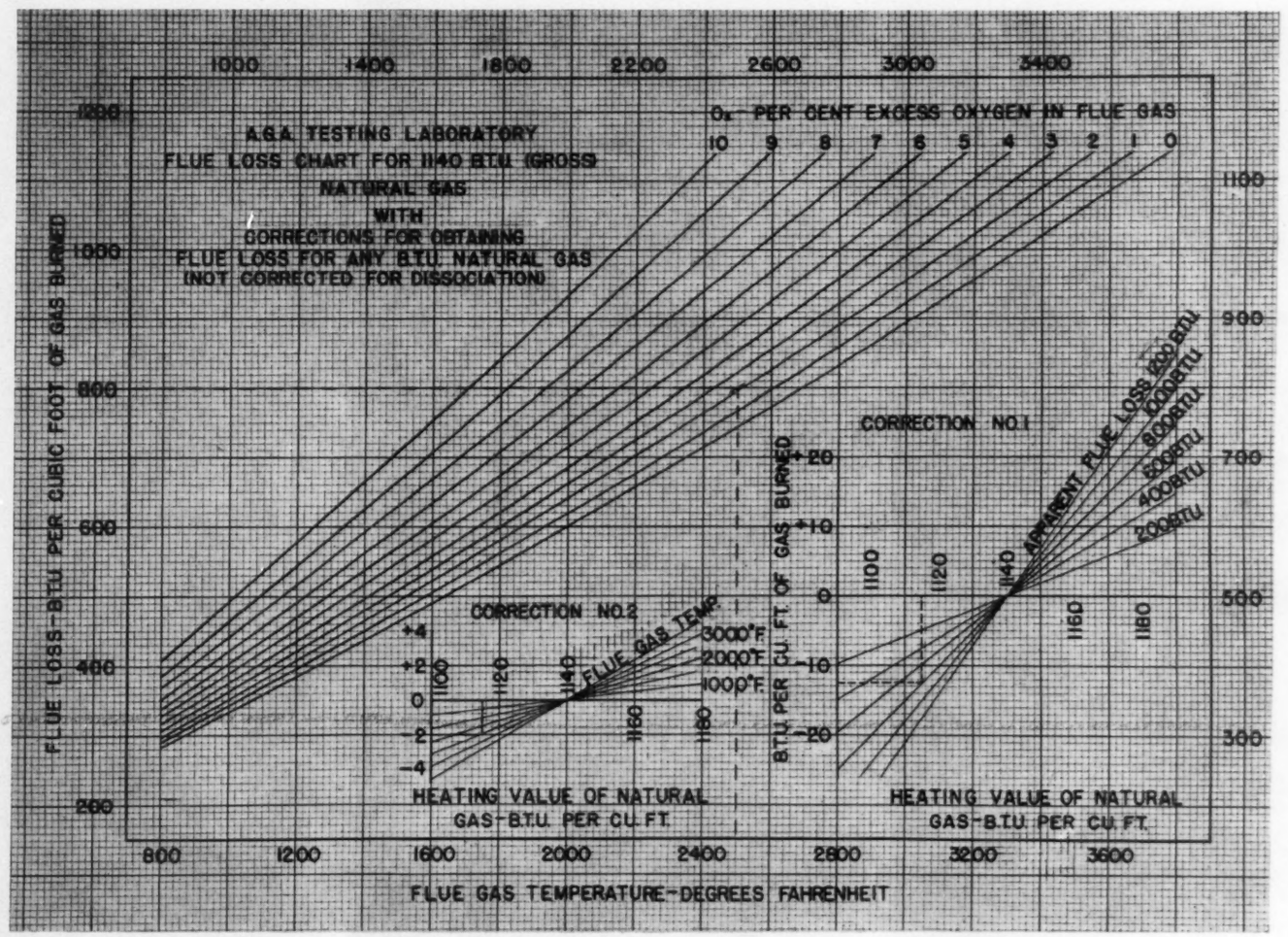
High Temperature Flue Loss Charts

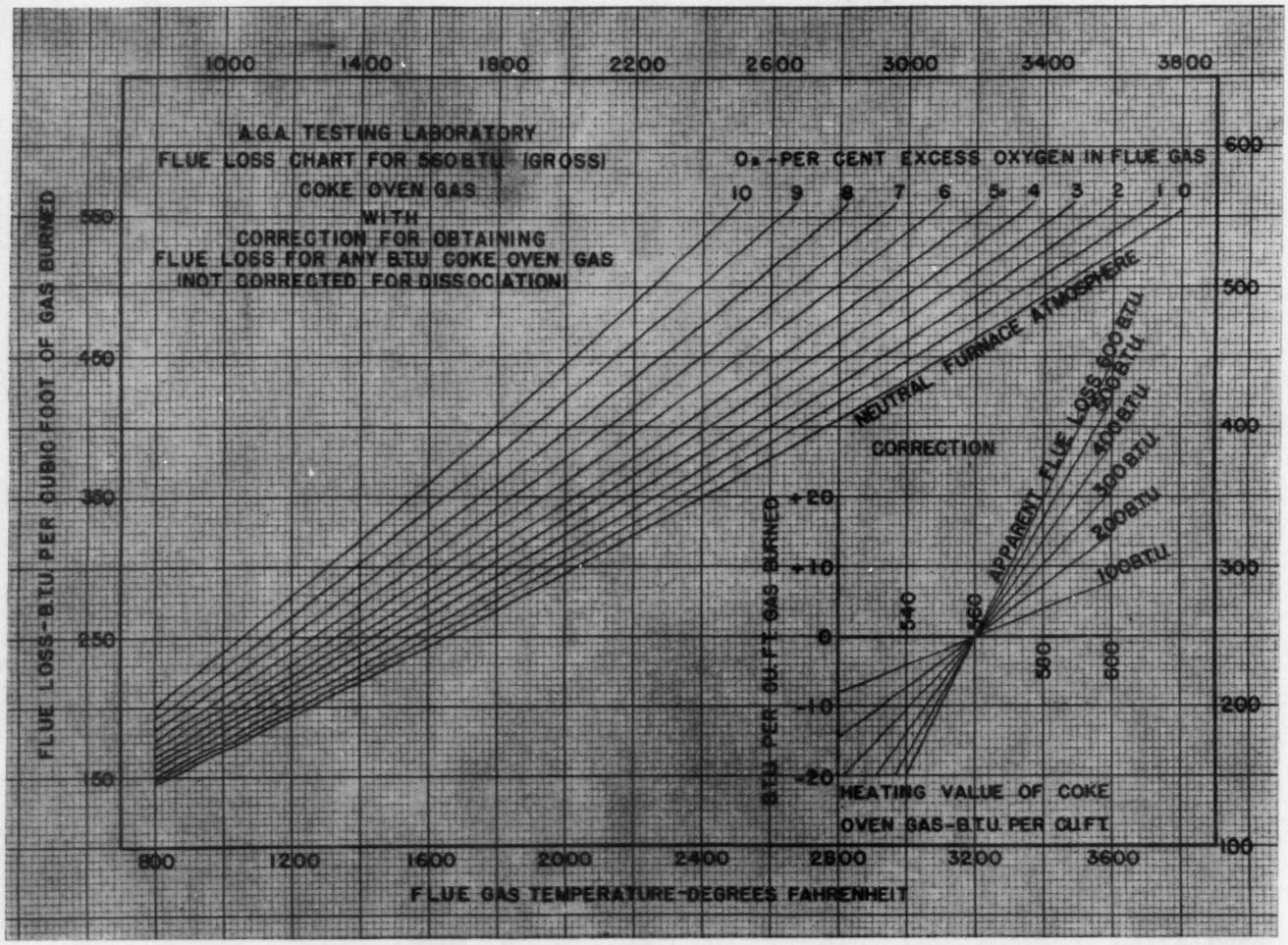
Developed At American Gas Ass'n Testing Laboratory

INDUSTRIAL gas engineers will find the two charts exhibited herewith of considerable value in increasing the accuracy as well as the speed of making flue loss calculations. These charts, prepared by industrial gas engineers at the American Gas Association Testing Laboratory, afford means of precisely and quickly determining the flue losses from high temperature industrial gas furnaces when using either natural or manufactured gas. It will be noted that the graphs are prepared to cover a comparatively wide range of heating values for both types of gases. The curves are presented in such manner that the variations of flue loss attributable to different furnace atmospheres (or degrees of over-aeration) can also be taken into account.

In the preparation of these charts Laboratory engineers computed, with all possible precision, flue losses in B.t.u. per cu.ft. of gas burned for hundreds of different conditions of industrial gas utilization representing various combinations of flue gas temperature, per cent excess oxygen, type of gas, and gross heating value of the gas. Analyses of the results culminated in the preparation of the charts.

An example may best illustrate the manner of use of the accompanying curves. Assume a steel treating furnace consuming natural gas having a heating value of 1115 B.t.u. per cubic foot and operating at 2500 degrees F. with an oxidizing furnace atmosphere containing 2.2 per cent excess oxygen (O_2). From the family of 10 flue loss curves for 1140


A.G.A. TESTING LABORATORY
FLUE LOSS CHART FOR 1140 BTU (GROSS) NATURAL GAS
WITH
CORRECTIONS FOR OBTAINING
FLUE LOSS FOR ANY B.T.U. NATURAL GAS
(NOT CORRECTED FOR DISSOCIATION)
O2 - PER CENT EXCESS OXYGEN IN FLUE GAS
10 9 8 7 6 5 4 3 2 1 0
FLUE LOSS-BTU PER CUBIC FOOT OF GAS BURNED
CORRECTION NO.1
APPARENT FLUE LOSS 600 BTU
500 BTU
400 BTU
300 BTU
BTU PER CU. FT. OF GAS BURNED
CORRECTION NO.2
FLUE GAS TEMP.
3000°F.
2000°F.
1000°F.
HEATING VALUE OF NATURAL GAS-B.T.U. PER CU. FT.
HEATING VALUE OF NATURAL GAS-B.T.U. PER CU. FT.
FLUE GAS TEMPERATURE-DEGREES FAHRENHEIT


A.G.A. TESTING LABORATORY
FLUE LOSS CHART FOR 550 B.T.U. (GROSS) COKE OVEN GAS WITH CORRECTION FOR OBTAINING FLUE LOSS FOR ANY B.T.U. COKE OVEN GAS (NOT CORRECTED FOR DISSOCIATION)
O2 - PER CENT EXCESS OXYGEN IN FLUE GAS
10 9 8 7 6 5 4 3 2 1 0
NEUTRAL FURNACE ATMOSPHERE
CORRECTION
APPARENT FLUE LOSS 600 B.T.U.
500 B.T.U.
400 B.T.U.
300 B.T.U.
200 B.T.U.
100 B.T.U.
B.T.U. PER CU. FT. GAS BURNED
+20
+10
0
-10
-20
540
560
580
600
FLUE LOSS - B.T.U. PER CUBIC FOOT OF GAS BURNED
HEATING VALUE OF COKE OVEN GAS - B.T.U. PER CU. FT.
FLUE GAS TEMPERATURE - DEGREES FAHRENHEIT
1000 1400 1800 2200 2600 3000 3400 3800
800 1200 1600 2000 2400 2800 3200 3600
600 500 400 300 200 100
550 500 450 400 350 300 250 200 150

B.t.u. per cubic foot natural gas, a flue loss of 800 B.t.u. per cubic foot of gas burned would be secured. To compensate, however, for the deviation between the actual heating value of the gas burned and that upon the basis of which the flue loss curves were computed, certain corrections must be applied to the apparent flue loss of 800 B.t.u. The first correction for heating value would be —12.5 B.t.u. per cubic foot of gas burned, as obtained from the correction family employing flue loss as a parameter. The second correction would be —2.0 B.t.u. per cubic foot of gas burned, as obtained from the correction family employing flue gas temperature as a parameter. Hence, the true flue loss could be fixed at 800 — 2.0 — 12.5 = 785.5 B.t.u. per cubic foot of gas burned. Similar procedures must be followed where coke oven gas constitutes the fuel employed, although, of course, the second set of curves should be used. Further, inasmuch as the flue gas temperature correction (Correction No. 2 on the chart), applied in the case of natural gas, is of negligible magnitude where coke oven gas is utilized, no such plot appears on the chart for manufactured gases.

It has been demonstrated on several occasions at the A.G.A. Testing Laboratory that flue loss calculations for high temperature installations (above 1000 degrees F.), made on the basis of the curves here presented, are of considerably greater precision than those ordinarily obtained in practice. Their value lies chiefly in the fact that, whereas most simplified methods of graphical approximation yield the flue loss for a similar gas of nearly, but not exactly, the same heating value as the one used, the methods here discussed affords a reliable and tested manner of correction to the exact heating value.

However, it must be realized that this method of determination is not entirely devoid of error. The curves shown are not corrected for the effects of dissociation of water vapor into hydrogen and oxygen and carbon dioxide into carbon monoxide and oxygen. If the per cent of excess air is at all sizable, however, the error thus introduced is scarcely appreciable. Further, in the computation of the charts here offered, all condensation into liquid water of the water vapor contained in flue gases was assumed to occur at room temperature (60 degrees F.). Inaccuracies arising from this source are, fortunately, negligible in practically all field work.

These American Gas Association charts, therefore, offer what is believed to be the most accurate ready means of determining flue losses from high temperature gas furnaces under widely varied conditions of operation and on the basis of customarily available data.

Wisconsin Supreme Court Restrains Municipal Competition

The Supreme Court of Wisconsin has handed down a decision of general interest to utility companies in the case of the Wisconsin Power and Light Co. vs. the City of Beloit. The Court sustained the company's contention that a city cannot without a certificate of convenience and necessity from the State Commission construct its own power plant to compete with a private company holding an exclusive indeterminate permit to serve within such municipality. The decision holds that the utility has a franchise not only to furnish electrical service to the inhabitants but to the municipality itself. In the Beloit case the city was contemplating engaging in street lighting and other service for municipal purposes.

DOMESTIC SALES

Launching Natural Gas Heating in Michigan

• **H. C. HAROLDSON, The Commonwealth and Southern Corp., Jackson, Mich.; addressing the Michigan Gas Association annual convention, Grand Rapids, Mich., June 19-20—(Abstract):**

BAY CITY and Saginaw, Mich., which hitherto were served with 540 B.t.u. and 570 B.t.u. manufactured gas respectively, obtained an 1100 B.t.u. natural gas from Michigan fields in the late summer of 1933. These divisions of the Consumers Power Co. serve 167,000 population, and contain 25,633 active meters.

As is usual in natural gas change-overs, downward rate revisions were made and it remained to build load quickly in order to protect revenues and take advantage of increased capacity of distribution systems. To determine whether domestic customers may be expected to use more heat for cooking and water heating when served with natural gas an interesting comparison was made in Peoria, Ill., where natural gas supplanted manufactured gas in April, 1932. After six months with natural gas an analysis of 2215 accounts was made, covering May to October, 1930, and the same six-month period in 1931 and 1932. In 1930 (manufactured gas) the average use was 81.18 therms per customer; in 1931 (manufactured gas) 81.23 therms; in 1932 (natural gas) 84.14 therms—showing only 3.6 per cent increased usage presumably due to natural gas.

The Consumers Power Co. in the light of the above showing launched a vigorous house heating activity in the Bay City and Saginaw divisions. Rates were as follows for space heating:

First 300 cu. ft. or less	$ .75 net
Next 1700 cu. ft.	1.50 net per M
Next 2000 cu. ft.	1.00 net per M
Over 4000 cu. ft.	.60 net per M

Under these rates space heating costs were about 63½ cents per M c.f., equivalent to coke at about $12 per ton. Most prospects in the territory were using coke at $7.50 per ton, leaving the gas company a considerable sales job. It was determined to install conversion burners for a selected list of prospects on a trial basis for one heating season, with a guaranteed operating cost. All that was required of the customer was that his credit be good, that he pay gas bills, and also $2 per month as evidence of good faith and to partially cover costs of connecting the burners.

Heat losses on each house were computed according to standard methods, the company taking its chances on experiencing a normal winter. Salesmen chosen for their sales ability rather than heating experience started in July, 1933, on a salary and commission basis. They were trained to measure houses, compute heat losses and prepare estimates of costs by months. Experienced house heating engineers checked estimates, examined furnaces for convertibility to gas, and specified the required equipment. The quota for the last half of 1933 was 800 new gas heating customers, but the sales force of 14 men signed up 995, or 4.1 per cent of the active domestic meters.

About 5 per cent of the jobs had been removed by the end of the year.

In spite of the fact that the past heating season was 17 per cent colder than the average of the last seasons and 20 per cent colder than the previous season, gas consumption ran above guaranteed figures for only 25 per cent of the jobs, and these by very small percentages.

Customers are not required to sign a purchase contract until next fall, but 297 of them had already signed by June 9. Jobs lost since the first of the year raised the total loss to about 9.5 per cent and if another 10 per cent should be lost it would still leave the company with the 800 jobs which were originally estimated to be needed.

A Sales Slant on Credit and Collections

• **NORTHBERT O. FRATT, credit and collection manager, Seattle Gas Co., Seattle, Wash.; addressing Northwest Conference, Pacific Coast Gas Association, Portland, Ore., June 21-22—(Abstract):**

CLOSE cooperation between the sales department and credit department is essential to both branches. Credit departments must appreciate the value of new business, and the sales difficulties in securing it; sales departments must appreciate that the best insurance on an order is a substantial down payment, along with adequate credit information secured at the time the sale is closed.

Seattle Gas Co. combines credit and collection functions under one department. Usual efforts are made to retain business already sold; the only accounts repossessed are those definitely proven to lack ability to pay.

Salesmen are regarded as the logical collectors of merchandise accounts for four reasons: (1) they have ready entre to the customer; (2) their sales are not completed until equipment is paid for; (3) they can use a personal appeal in their request for payment by pointing out that the customer supplied them with certain information at the time the sale was consummated, which they took in good faith; (4) salesmen appreciate that additional appliances cannot be sold to customers who have delinquent balances.

The Seattle company pays a modest percentage on collections to salesmen, and finds that most salesmen welcome the chance to see customers again, even for the purpose of collection.

Where salesmen are unsuccessful in collections they turn the account to the attention of the credit department's special merchandise collector. This collector is essentially a salesman, with considerable merchandise sales experience on all types of gas equipment.

Credit policies of the Seattle Gas Co. are sales-slanted. Credit representatives attend sales meetings, keep advised on the new appliances and campaigns, and help to create the feeling that they are one with the salesmen.

Collectors are educated along sales lines; at the weekly collection meeting the new gas equipment is covered, and current sales activities revived. As a result, the collection department is second only to the shop department in turning in sales prospects.

There are no "grouches" in the Seattle collection department. Collection activities have been successfully converted into a game, with quotas and rewards. For reducing the "arrears" and cutting down bad debt losses in line with quota requirements, collectors are taken in a group to a ball game, hockey game, or picnic—at company expense. Penalties are exacted for non-pay shut-offs and repossessions; as a consequence collectors are out "selling" the idea of "paying."

To illustrate the results being secured, the company last year reduced its shut-offs for non-pay from approximately 3,000 to about 1,200, and its bad debt charges from a little more than 2½ per cent to approximately 1¼ per cent over the same period. Gas arrears have been reduced by approximately one-half. The same condition exists in merchandise accounts receivable.

UTILIZATION

Gas Savers, etc., for Domestic Appliances

● **U. S. Bureau of Standards Circular No. 404, issued April 2, 1934; by John H. Eiseman; topic "Cautions Regarding Gas-Appliance Attachments"—(Abstract):**

A GREAT many attachments are offered to the public, usually by house-to-house salesmen, which, it is claimed, will materially reduce gas bills if installed on gas appliances. These devices are of many different types; some of them are placed over gas range burners, some in the vent of the oven or water heater, and some in the piping leading from the gas meter.

During the past few years the Bureau of Standards has been requested to test a number of these attachments and, because many of them not only do not fulfill the claims made for them, but create hazardous conditions when used, the results are being brought to the attention of the public.

The primary objection to most of these attachments is that they are not safe, as they tend to cause incomplete combustion of the gas with the consequent liberation of carbon monoxide. This is the reason why they are not included by manufacturers in the appliance design. Appliance designers are continuously seeking appliances of the greatest possible efficiency, combined with a reasonable margin of safety from formation of dangerous fumes. These attachable appliances reduce this margin of safety to a hazardous and often vanishing point.

It is interesting to note that the increased efficiency claimed for gas savers is usually very close to 30 per cent, which is perhaps a psychological compromise between an unimpressive 10 per cent and a too enthusiastic 50 per cent; also that the greatest sales efforts are usually expended in the spring and summer when gas bills are normally reduced by increasing temperatures, but the credit may be given to the gas saver by unthinking purchasers.

The most frequently offered gas savers are those designed for installation on range top burners. Typical designs are shown in Figs. 1, 2 and 3. These devices, in general, do not correct any fault which may exist in the customers' appliance, except the very rare condition where the burner is placed too far below the cooking top. They occupy much of the space between the burner and the utensil, interfering with the escape of the products of combustion and consequently with the access of air to the flame. The use of these devices invariably causes a lifting or elongation of the flames, a condition which usually results in the formation of carbon monoxide. The performance of some of these devices, as depicted, is shown in Table No. 1.

TABLE NO. 1.—TESTS OF GAS SAVERS INSTALLED ON A STANDARD STAR BURNER.

Condition of test	Gas rate B.t.u. per hr.	Efficiency Per cent	Carbon monoxide* Cu. ft. per hr.
Without saver	6,000	35.3	0.0
With no. 1 saver.....	6,000	37.4	.8
With no. 2 saver.....	6,000	41.7	.56
With no. 3 saver.....	6,000	35.3	1.05
With no. 4 saver.....	6,000	35.2	.57
Without saver	9,000	36.3	0.0
With no. 1 saver.....	9,000	37.5	.93
With no. 2 saver.....	9,000	38.8	.99
With no. 3 saver.....	9,000	36.2	1.07
With no. 4 saver.....	9,000	35.7	1.66
Without saver	11,000	37.7	0.0
With no. 1 saver.....	11,000	36.3	.79
With no. 2 saver.....	11,000	37.3	.89
With no. 3 saver.....	11,000	36.4	.93
With no. 4 saver.....	11,000	36.3	1.99

*For safe operation no carbon monoxide should be produced.

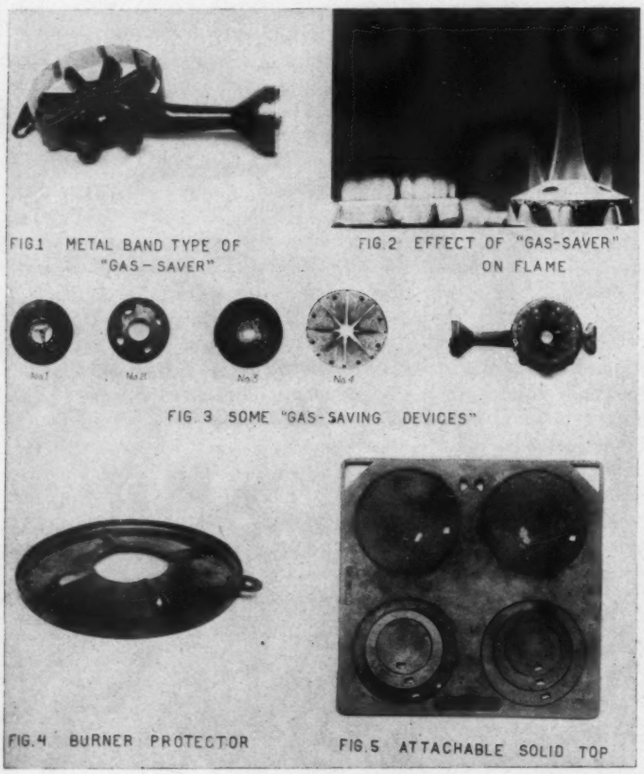
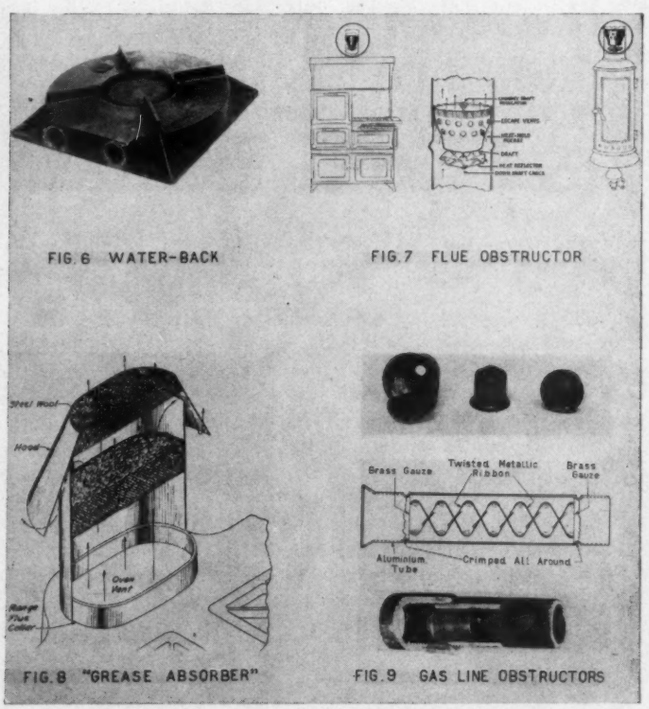


FIG.1 METAL BAND TYPE OF "GAS-SAVER"
FIG.2 EFFECT OF "GAS-SAVER" ON FLAME
FIG. 3 SOME "GAS-SAVING DEVICES"
FIG.4 BURNER PROTECTOR
FIG.5 ATTACHABLE SOLID TOP



ILLUSTRATIONS SHOW VARIOUS TYPES OF CURRENTLY-MARKETED GAS APPLIANCE ATTACHMENTS.

"Burner Protectors" are typified in Fig. 4. They are placed directly on the grids of a gas range, and protect the burners by catching anything that spills or is boiled over. Such accessories, being held at a sufficient distance from the burner, allow the gas to be completely burned, but greatly increase the amount of gas used and the time required to perform a given operation.

Attachable solid tops, as shown in Fig. 5, are claimed to provide, for the open top range owner, all the advantages advanced by the proponents of the regular solid top range. These attachments, however, applied to a range not designed for them, or one for which they were not specifically built, almost invariably increase the gas consumption, form large quantities of dangerous fumes, and may even become a fire hazard by the appearance of half-smothered flames at unexpected places.

Fig. 6 shows the so-called "waterback," designed for placement on the range top burner and connection to a water storage tank, the theory being that waste heat from the burner, while ordinary cooking is progressing, is used to heat water at no cost. While these devices may be installed so as not to interfere with combustion, the free hot water statement is a fallacy. Gas consumption is considerably increased when these attachments are in place. Tests on the one depicted showed that although some water is heated and stored in the tank, the amount thus heated, and the final temperature attained, are not sufficient to make up for the increase in the amount of gas required for cooking.

The most dangerous class of attachments are those which are placed in, and partially close, the vents or flue outlets of appliances. Such obstructions are varied in construction and in the purposes they are said to serve. Some of them are alleged to remove grease, smoke or odors; to remove carbon monoxide and water vapor; to add water and humidify the fumes; to trap or retain heat; even to eliminate all products of combustion, vaporize all fumes, break up the heat waves, and allow the saturated heat fumes generated by the gas flame to pass freely up the chimney. Figs. 7 and 8 show typical specimens.

While it of course is desirable to prevent extreme and unnecessary draft through the appliance and up the flue, a certain amount of draft is absolutely necessary for the proper and safe performance of the appliance. The draft control has been properly worked out and built into the appliance by the manufacturer, with the necessary safety factor. Any additional obstruction placed in the flue is almost certain to cause smothering of the flames and a most hazardous condition. The only exceptions to this would be where appliances are to be operated on a different fuel, or for a different purpose, from that for which they were originally designed. Changes may then be desirable, but should be made only by a competent combustion engineer.

Gas line obstructors are typified in Fig. 9. These devices are sold for placement in the gas piping between the meter and the appliance. They are advocated, in general, as gas savers, and sometimes are claimed to furnish absurd benefits such as atomizing the gas and eliminating stratification of the gases in the pipe. The only purpose they can accomplish is to act as an obstruction in the pipe and reduce the amount that can flow through under any given pressure. Inasmuch as each individual appliance has at least one control for reducing flow to the desired amount, and it is desirable to have full line pressure up to this control for the sake of capacity and proper performance, there is no justification for these obstructions and the probability exists that they will reduce the capacity of the house line to the point of inadequate supply at peak demand.

DISTRIBUTION

Hydration and Oil Fogging In Chicago

● **H. E. FERGUSON, Peoples Gas Light and Coke Co., Chicago; addressing A. G. A. Joint Committee Conference of Production and Chemical Committees, New York, May 21, 1934; topic "Gas Conditioning with Reference to Hydration and Oil Fogging Practice."—(Abstract.)**

Hydration

THE advocates of humidification of gas maintain that a high water vapor content prevents the drying out of moisture, oil, napthalene, tar and other ingredients deposited in the minute openings of the pipe system, and held in regulator diaphragms and pipe joints, thus preventing leakage; prevents the release of mill scale, rust and dust, to be blown along by the gas stream; makes the gas more nearly approach the saturated condition specified by regulatory bodies when defining the standard cubic foot and the heating value thereof, thus preventing loss to the company when selling gas on a therm basis.

H. E. Ferguson

There is some question as to whether or not it is good policy to depend on the retention of tar or deposited dirt in main wall cracks or joints as a means of insuring satisfactory main operation or of reducing potential leakage losses. Intermittent wetting by supersaturated gases is a more probable cause of stiffening and failure of the leather diaphragms in regulators or meters than is desiccation by unsaturated gases. Furthermore, although the mitigation of dust troubles and reduction of billing errors may be sound reasons for desiring that gases in mains and meters be saturated with water vapor, they do not of themselves prove that recourse should be taken to artificial rehydration. An examination of the characteristics of a system may disclose that nothing may be gained by further addition of water vapor.

The gas normally distributed in Chicago is approximately a 50-50 mixture of dry natural gas, and manufactured gases of various compositions and moisture contents, the latter having gone through a water sealed holder and therefore being humidified at the prevailing atmospheric temperature. It leaves the mixing point through 48- and 36-inch transmission mains at 4.5 to 5.0 lbs. pressure, and is later fed into smaller distribution mains operating at 5.0 and 6.0 inches water pressure.

Tests over a number of years have shown that the gas assumes main, or ground temperature after about 3 miles flow from the production station; that this ground temperature varies from about 40° in the winter to 70° in the summer; and that as a result the percentage of water vapor in the transmission gas is very constant from year to year and very close to saturation. This is shown in Fig. 1, wherein it will be observed that all excess of moisture above that required to saturate the gas

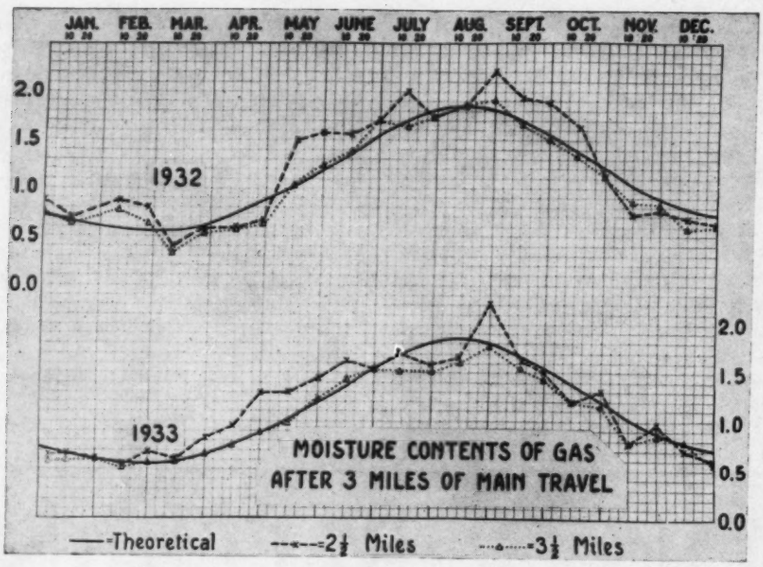


Fig. 1.

at ultimate main conditions has been deposited.

During periods in 1932 and 1933 artificial humidification was resorted to, but in spite of considerable additional moisture at the injection points, no increase was noticed after 3 miles of gas main travel, the water vapor having condensed out. It is therefore concluded that the system is so constituted as to provide adequate and maximum possible humidity without artificial assistance.

If the gases are at ground temperature and all moisture in excess of that required to saturate them at ground temperature and transmission main pressures has been condensed out due to their having traveled more than 3 miles, there will not be enough moisture present for them to be saturated at the lower distribution main pressures. So that gas in those distribution mains fed from regulators more than 3 miles from the send-out points cannot be more than 78 per cent saturated. Direct determinations of moisture contents of gases at services indicated them to be normally about 75 per cent saturated with respect to ground temperatures.

It can be seen that if a particular district is alternately fed, first by gas from transmission mains at a point only a short distance from a production station or a distribution station employing a water-sealed holder, and then by gases drawn from transmission mains at a point more than 3 miles from a send-out location, the gas in that district will be alternately wet and dry—first supersaturated to 125 or 150 per cent, and then only 75 per cent saturated. Or if a particular district is alternately fed from a nearby water-sealed holder and by a holder more than 3 miles distant, the same alternation of conditions in the mains and services will exist. Such a variation in moisture content is believed to be a far more important cause of meter failures than either excessive moisture content or excessive dryness.

Further support of the belief that regulation of the moisture content of gases is more desirable than a hasty increase through application of artificial hydration can be found in a comparison of the diaphragm-bleaching figures over a period of years. In the two years preceding the reduction in excess of moisture content which accompanied the substitution of natural gas mixtures for coal gas and carburetted water gas, about 1.2 per cent of the meters received at our shop had bleached or blanched diaphragms — over 4,000 out of 350,000. After the conversion to a drier, 800 B.t.u. gas, the percentage dropped to about 0.7 per cent—1,700 out of 250,000.

Oil Fogging

Since the original attempts to "lubricate mains" by hand-pumping gas oil into station drip-pots, and allowing the 125°F. sendout gas to "pick up the oil," the technique of oil fogging has undergone considerable elaboration: automatic equipment proportioning the oil input to the gas sendout has been designed, high degrees of division of the fogging oil have been attained, and special fogging oils have been produced. Also new reasons for oil fogging have been unearthed. In addition to attempting to lay the dust in mains near stations by wetting with oil, fogging is now practiced with the intention of affording the internal walls of mains some protection against rusting by condensed water vapors, of stopping leaks, of preventing desiccation of joint and valve packings, of lubricating valve and regulator stems, of embalming rubber gaskets and of preserving meter diaphragms.

From April, 1931, until the spring of 1932, gas was fogged only at two production stations; since the spring of 1932 all gas as sent out from production stations or re-pumped at distribution stations has been fogged. During 1933 fogging was performed at seven or eight points on the main distribution system, using various mixtures of oils in hot foggers at distribution stations and holders as well as at production stations. The amounts of drip oil pumped during this period were fairly regular from month to month.

Several refining companies have gone to considerable expense and trouble to market oils believed particularly suited for all sorts of fogging operations. Unless it can be definitely shown that the results obtained from the use of these special materials in a particular distribution system are at least twice as good as the results obtainable by use of gas oil, straw oil or drip oil, economic reasoning will oppose paying twice as much for these special fogging oils as for the latter named materials. Quite satisfactory results have been obtained by fogging the mixture of natural and coal gases with heavy distillate gas oils and wash oils at a rate of about 3 gallons per million cubic feet, returning to the fogging oil stock all that heavy drip oil from mains near stations which is obviously deposited fogging oil. When using a gas oil of wide distillation range in hot foggers it is usually advisable to drain the vaporizer tanks daily to remove tarry residues remaining from fractionations—but in spite of the loss of

TABLE NO. 1—FOGGING OILS

	Western Gas Const. Co. Specif'n.	Straw Oil	Gas Oil	Gas Oil	Drip Oil 48" H.P.	Drip Oil 24" H.P.	Drip Oil 20" L.P.	Commercial Fogging Oil
Specific Gravity		.8726	.864	.843	.879	.854	.853	
I. D. T. °F.	600	570	437	302	464	286	307	585
Distillation °F.—								
300 - 400	0	0	0	1.5	0	2.2	3.0	0
400 - 500	0	0	10.0	13.8	1.0	7.1	21.5	0
500 - 600	0	5 0	42.0	43.8	9.0	59.9	49.5	5.0
600 - 700	75.0	82.5	28.0	32.8	65.0	27.8	23.5	77.0
Above 700	25.0	12.5	20.0	8.1	25.0	3.0	2.5	18.0

up to 20 per cent of the fogging machine input and the cost of labor involved, the use of gas oils is believed more economical.

In Table No. 1 is indicated the nature of drips returned to fogging stock, as well as of some of the materials used for fogging.

TRANSMISSION

Specifications for Asphalt Protection

• U. B. BRAY and F. S. Scott, Research Department, Union Oil Co. of California; addressing Soil Corrosion Conference, Los Angeles, Calif., May 10, 1934; topic "Specifications for a Modern System of Bituminous Pipe Line Protection" —(Abstract):

A REVIEW of some of the experimental work conducted by the Union Oil Co. of California in the attempt to develop asphaltic coating materials for use on its own system of pipe lines, and presentation of the resulting specifications for pipe line protection now in use by that company, these specifications having been in use for somewhat over two years and representing the company's best knowledge at the present time.

Stress was laid on the loose and indiscriminate use of the term "asphalt," applying as it does to a large number of distinctly different commodities; this condition being responsible for many conflicting opinions regarding the performance of asphalt as a pipe line protective medium, and often resulting in the selection of unsuitable material giving unsatisfactory results. In addition to this, recent developments in asphalt technology permit the control of penetration and pliability, for a given melting point, within limits practically impossible a decade ago. This wide range of possibilities has often resulted in the selection of unsuitable materials giving unsatisfactory results, rather than in uniformly creditable performance.

The system of coating described in this paper consists in (1) cleaning and priming the steel pipe to be treated, (2) coating or sealing with a high melting, high penetration, high flash point asphalt of unusual adhesiveness, (3) coating with a high melting, low penetration soil resistant enamel, (4) wrapping (bonded) with asphalt or tar saturated wrapper, and (5) applying another coat of the soil resistant enamel. Where the soil conditions are known to be very severe, a second layer of wrapper followed by a coat of enamel is also used.

Primer: In view of the uncertainty of the function and performance of primers over long periods of time, it was decided, if possible, to make the system of pipe line protection as independent of the efficiency of the primer as possible. A decision to rely upon the primer for little more than temporary protection between cleaning and coating was recognized as somewhat unorthodox and to be justified only on the basis that a coating material had been found that had such adhesiveness when applied even to cold steel that a primer was not necessary to establish a bond to the steel. The primer actually used in connection with the major specifications for pipe line protection by our company for the last two years is a compounded product of the paint type which dries rapidly to give a nontacky film in one hour in the open.

Sealing Asphalt: The sealing material selected for this purpose is similar in properties to Battery Sealing Compound, which has been used successfully for a long period of time to seal the lids on ordinary lead storage batteries, except that for pipe line work it is produced with a higher melting point. This type of material has remarkable adhesiveness and is very difficult to displace from a steel surface. The significant specifications for this material, which has been called Pipe Sealing Asphalt, are as follows:

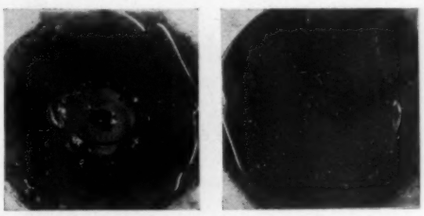
Melting point (B & R), °F	190 - 200
Penetration at 32°F. (200 g.-60 sec.)	20 min.
Penetration at 77°F. (100 g.- 5 sec.)	30 - 40
Penetration at 115°F. (50 g.- 5 sec.)	75 max.
Ductility at 77°F., cm	2.0 min.
Ductility at 32°F., cm	1.75 min.
Estimated quantity required per 1000 square feet of pipe surface, 3/32-inch thick	500 lbs.

Soil Resistant Enamel: It was soon demonstrated that enamels, or bituminous materials containing mineral reinforcing agents or fillers, were distinctly superior, in their resistance to both sudden impact and soil stress, to straight bituminous products without filler, and, while a high melting point air-blown asphalt of low penetration came the nearest to furnishing the desired characteristics for a soil resistant coating, it was apparent that it is desirable to incorporate mineral filler into even the most promising bituminous material to obtain the best results. Consequently, an investigation was made of the various types of fillers available for this purpose. Of the possible fillers, several varieties of rock dust, silica, slate dust, talc, mica, and diatomaceous earth were investigated, and it was found that if diatomaceous earth is properly incorporated into the bituminous material, it has remarkably greater reinforcing effect than any of the other fillers.

The difficulty of incorporating the diatomaceous earth uniformly in the high melting point bitumen, due to absorbed moisture and air on the diatom structures, has been satisfactorily overcome, and the enamels containing diatomaceous earth have the distinct additional advantage of exhibiting practically no settlement of the filler when held in a melted condition for a long period of time.

To illustrate some of the test methods used in the study of enamels of different characteristics, the following example is given.

Impact Test: This test consists in dropping a 1.65 pound steel ball from a definite height upon a steel panel primed and coated with the bituminous material being tested. The extent of the shattering caused by the percussion waves is observed by starting at the point of impact and carefully peeling away the loosened coating with a sharp knife. If desired, the exact area wherein the bond between the coating and the steel has been shattered can be measured accurately with a planimeter, but ordinarily a satisfactory rating can be obtained by visual comparison with a reference enamel tested at the same time. Fig. 1 illustrates the behavior of two different asphaltic enamels subjected to this test.



Good Enamel Poor Enamel

FIG. 1. IMPACT TEST

The enamel finally chosen as being the best for our purpose is described by the following specifications:

Melting point (B & R), °F	235 - 250
Penetration at 77°F. (100 g.-5 sec.)	2 - 4

Penetration at 115°F. (50 g.-5 sec.)	10 max.
Ash content, diatomaceous earth, %	15 - 17
Fire point, Open Cup, °F.	575 min.
Estimated quantity for each application required per 1000 square feet of pipe surface, 3/32-inch thick	550 lbs.

Wrappers: The use of wrappers with bituminous coatings appears to be justified in practically every case where a coating of any kind is needed. Felt wrappers made from rag fibers or asbestos and saturated with asphalt or coal tar constitute a desirable complement to every bituminous coating which we have examined. Very satisfactory results can apparently also be obtained with saturated Osnaburg fabric in combination with the proper bituminous materials. In the company operations, the use of felt wrappers has been established as standard practice.

ACCOUNTING

Accounting for Utility Appliance Sales

● M. H. PARKINSON, comptroller, Penn Central Light and Power Co., Altoona, Pa.; addressing Pennsylvania Gas Association annual convention, Wernersville, Pa., May 10, 1934—(Abstract):

PENNSYLVANIA'S laws have been interpreted by the courts to give utility companies the right to merchandise appliances under their charters, and recent amendments to the Public Service Company Act contain no prohibition whatsoever of this right, provided that proper accounting for such activities is maintained.

Improper or inadequate accounting for merchandising activities has been one of the real sources for criticism against public utility merchandising from outside the industry. Through improper accounting we have failed to consider the division of cost between promotional activities and activities relating solely to the sale of appliances.

The Uniform Classification of Accounts prescribed by the Public Service Commission of Pennsylvania, provides that merchandising activities shall be accounted for as a part of Non-Operating Revenues and Expenses, with two separate accounts—one for revenue and one for expenses. Accounting for sales of appliances should be included as a cost of promotion under new business expense.

Amendments to the Public Service Company Law enacted in 1933 declare it unlawful to discontinue public service to any consumer for the latter's failure to pay the whole or any installment of purchase price or rental of appliance or equipment sold to him by the utility company.

The amendments further specifically require that utilities provide separate accounting in all activities relating to the sale of appliances, as regards property used, in revenues obtained from, and payments to those engaged in sales work.

A special committee of the Pennsylvania Gas Association, working with similar committees of the state's Electric Association and Natural Gas Association, submitted to the Public Service Commission a suggested draft for a "Uniform System of Accounts for Appliance Merchandising." In general this suggested system of accounts follows the recommendations made by A.G.A. and N.E.L.A. committees a few years ago, and in addition incorporates recognized principles of accounting for retail sales activities, keeping in mind at all times that the major objective of appliance sales by utilities is one of promotion, in that load building benefits outweigh merchandising profits and that therefore profits and losses resulting from appliance sales should be accounted for in New Business Operating Expenses. Some interpretations in the suggested system of accounts merit special comment:

Service During Guarantee Period: All that is charged to this account is the cost of making repairs and replacements to appliances sold by utilities during guarantee period (interpreted as guarantee period allowed by manufacturer of appliance). Cost of servicing done by utility as a general policy in keeping customers' appliances in condition was not included, these falling properly under transmission and distribution operating expenses. This division should not be difficult if proper record is kept of expiration dates of manufacturers' guarantees on appliances sold by the utility only.

Advertising and Demonstrations: This account should include only advertising and demonstrations in connection with the actual appliances sold by the utilities. Advertising done to promote use of the utility's service should not be charged to this account, nor should demonstration, nor home service work; these items properly fall under New Business Expense accounts. The same is true in introducing and demonstrating new appliances not previously offered for sale throughout the industry.

Joint Employees and Joint Expenses: Recent amendments to the Public Service Company Act call for separate accounting of time and expense of officers and employees primarily engaged in the utility side of the business, if they in any way take part in any appliance sales activity. The joint committee of Pennsylvania utility associations after careful consideration concluded that due to differences obtaining among the several utilities in the conditions under which such joint services are performed, it is impracticable to formulate any fixed rule governing allocation of pay and other expenses of employees between sales and general utility functions.

The division of joint expenses and joint salaries should proceed on some practical basis. One suggestion is for organization of a separate corporation to conduct the merchandising business, handling actual leasing of space, separate payrolls, and contracts covering compensation of utility employees for time devoted to appliance sales. Before such a step should be taken, however, a fair trial should be given by the utility to conducting appliance sales activities as a part of its own business. Deliberate judgments should be made in allocation of expenses and salaries as between utility functions and appliance sales functions of officers and employees. It is felt that records kept by utilities are presumptively correct, and the deliberate judgment of utility officers as to proper allocation of merchandising expense must be accepted in the absence of evidence of improper judgment on their part.

Rentals: Amendments to the Public Service Company Act also call for separate accounts for property used in appliance sales activities. Common sense rules based on principles underlying use of property should be applied by management and deliberate judgments made in allocating definite charges, having in mind costs of facilities, and cost of money, and charging the appliance sales activities only for their proportionate use of the facilities.

Similar requirements are facing continually in dividing charges between capital and expense, particularly by those companies which render more than one type of utility service. There is no essential difference in accounting for facilities used in appliance sales, and in accounting for facilities jointly used in different utility functions.

The suggested system provides the basis for disclosing to the world at large what utility appliance sales activities actually are, and in addition providing utilities with a reliable indicant of their progress in merchandising. At the same time it should provide an effective means of answering some of the criticism leveled against utility merchandising.

Pacific Coast Gas Association

Managing Director: Clifford Johnstone
Association Headquarters:
447 Sutter Street, San Francisco

President: George P. Egleston
General Manager, H. R. Basford Co.,
San Francisco

Portland Conference Sounds Progress Note for Gas Industry In the Pacific Northwest

THE Annual Northwest Conference of the Pacific Coast Gas Association was held at Portland, Oregon, on June 21 and 22, with the Portland Gas and Coke Co. as host. All meetings took place in the auditorium of the Public Service Building. The group of 125 to 150 delegates were unanimous in their appreciation of the hospitality afforded by Paul B. McKee, president of the Portland Gas and Coke Co., and his associates.

At the close of the meetings all delegates were agreed that the success of the conference had exceeded all expectations, and that extremely important and valuable work had been done to coordinate the various sections and activities of the Association, and to enable the industry to cope with its current problems. A hopeful, progressive, and fighting attitude was developed with respect to competitive fuels. Perhaps the most important step of all was the formation of a Gas Appliance Society, within the Portland Gas and Coke Co. territory, to promote the sale of gas appliances and uphold fair trade practices.

Geo. P. Egleston, president of the Association, opened the conference Thursday morning, introducing Wm. Moeller, Jr., of the Southern California Gas Co., recently named vice-president of the Association. Paul B. McKee then welcomed the delegates to Portland. He made the point that the conference gave opportunity to seriously take stock of the utility situation, and urged everyone participating in discussions to, as he expressed it, "speak in the raw."

Planning for the Future

Hilmar Papst, vice-president and general manager of the Portland Gas and Coke Co., then struck the key note of the Conference with a paper entitled "Planning for the Future." He brought out that the pressure of increased competition forces the manufactured gas industry to concentrate its energies in several definite directions: Perfection of gas supply as regards quality and uniformity; kind of appliances used by customers; service; methods of charging; sales activities; and publicity.

Quality and uniformity of supply can be readily attained by proper plant control of pressure, heating value and purification. With respect to appliances, all old and antiquated equipment should be replaced to quickly establish all customers on a modern basis; automatically controlled equipment only should be sold. Servicing and maintenance should be given strict attention, aided by manuals, more training of personnel, and increased free servicing so that all installations be brought up to a high standard of performance.

Considering methods of charging, Mr. Papst laid stress on the desirability of a combination rate for domestic consumers, as new business is readily taken on at the last step of such a rate, and competitive fuels forced to meet this same last step. Incremental cost studies will indicate how reductions can be progressively made so as to achieve the ultimate rate made possible by sales volume.

Sales activities, under the present period of economic change, require a new interest in the effectiveness of human contacts with the buying public, necessitating a higher degree of skill in sales management and better trained sales people; manufacturers and appliance dealers should be cooperated with to the fullest extent; the real value of gas service should be stressed, this value being actually the cost of the gas plus the various extra expenses inherent to the use of other fuels. The last requisite, publicity, requires bold statements, addressed through all public channels, setting forth the advantages of gas, without exaggeration, and the happenings and accomplishments within the industry —the public must be kept gas minded!

C. A. Swigart next presented an Illustravox Production, prepared by the Pacific Coast Gas Association, entitled "Home and the Range." This presentation, by a unique combination of projected pictures, dialogue and interspersed music, related the demonstration, sale and enthusiastic reception, into a typical home, of the modern gas range. It was vigorously applauded by the audience, and the thought expressed that it would be ideal for use at sales conferences, employee and small public gatherings, etc. Reproductions, for presentation, can be obtained from the Pacific Coast Gas Association.

Following this was a paper written by J. Earl Jones, commercial manager, and read by J. F. Pollard, vice-president and general manager, of the Seattle Gas Co. The key note of this paper was publicity built around the established fact that, in Seattle, gas cooking is 14 per cent cheaper than electric cookery. This paper appears on another page of this issue.

The next speaker, L. H. Dennis, national secretary, American Vocational Association, on the topic "Vocational Education in the United States," outlined the need for and progress of vocational education, pointing out the deplorably large percentage of young criminals in the penitentiaries. He said that the remedy for this is vocational education among the young people, and that all groups and industries should further this worthy cause.

The meeting then adjourned to the Congress Hotel for the Fellowship Luncheon, at which time Paul B. McKee introduced as guest speaker Walter W. R. May, manager, Portland Chamber of Commerce. The speaker delivered a very interesting and inspirational address on the past, present and future of the Northwest.

Load Building and Competition

The first afternoon was devoted to discussion of load building and competition. The first paper, by E. J. Ludeman, commercial manager, Washington Gas and Electric Co., on the subject of

"Domestic Water Heating," will be reviewed in next month's issue.

Next was a paper by E. L. Hall, operating manager, Portland Gas and Coke Co., entitled "House Heating," in which the author made a unique and complete analysis of competitive fuels, and evaluated the various intangibles which make fuels, other than gas, more costly than would appear to be the case when only material price is considered. This paper will be published in *Western Gas* for August.

E. L. Payne, general manager, Payne Furnace and Supply Co., and chairman, Manufacturers' Section, P.C.G.A., read a paper on the subject of "Air Conditioning for Comfort Through the Heating Cycle." He emphasized the present need for concentrating on proper installation and adjustment of the existing types of air conditioning equipment, recognizing warm air heating as the starting point. The industry, however, should not neglect to fortify itself with the necessary fundamentals and working practice to keep abreast of future improved conditions. This paper will be reviewed in an early issue.

Following this Frank Moon, Los Angeles Gas and Electric Corp., discussed refrigeration, outlining the sales practices of the Southern California companies, and giving it as his opinion that no gas company, however or wherever situated, could afford to neglect the active promotion of this valuable load builder.

An interesting feature on the afternoon program was C. B. Babcock's description of the new high-power gas lamp developed by General Gas Light Co. One of the lamps, which are of 3,000 candlepower and burn 50 cu.ft. of gas per hour, was on display in the meeting room and was demonstrated by Mr. Babcock.

The afternoon program concluded with a paper on "Selling Performance" by Pierre Vinet, Coast Counties Gas and Electric Co. and chairman Commercial Section, P.C.G.A. Highlights in the paper and discussion were that plumbers should be educated in proper gas technique, appliance should be stressed as "modern" and salesmen should talk from the consumers' standpoint.

Gas Appliance Society Organization Effected

The evening was taken up with the dinner meeting at which was accomplished the organization of a Gas Appliance Society for Portland Gas and Coke Co. territory. This meeting took place in the auditorium of the Public Service Building. Speakers were B. H. Parkinson, commercial manager, Portland Gas and Coke Co., on the subject of "There are Profits in Gas Appliance Sales"; H. M. Crawford, general sales manager, Pacific Gas and Electric Co., on "The Advantages of Organization"; Geo. P. Egleston, president, P.C.G.A., on "Gas Appliance Selling in California." Others on the program included A. E. Higgins and F. E. Vandaveer, of the American Gas Association, Joe Anderson, Powers Furniture Co., Louis Gevurtz, Gevurtz Furniture Co., and L. F. Chess, L. F. Chess Plumbing and Heating Co. Vic Johnson of Edwards Furniture Co. was elected president of the Society and J. King Bryon, secretary of the Retail Furniture Dealers of Oregon was elected secretary. Walter Woodmer, secretary of the Master Plumbers Association, was chosen treasurer.

In addition to the officers, the following directors were elected: S. A. Beck, Estate Stove Co., W. D. Hostetler, manager of the appliance department of Meier & Frank Co., Fred Van Hoomissen, Richmond Service Co., and B. H. Parkinson, commercial manager of Portland Gas and Coke Co.

The Friday morning program started with a paper on "The Outlook for the Increased Use of Manufactured Gas by Industry," by A. O. Leach, industrial engineer, Portland Gas and Coke Co. Several instances were cited where oil competition has successfully been met. Discussion brought out the thought that gas appliances should be designed so that conversion to other fuel would be difficult.

The next paper was on "Commercial Cooking and Baking" by C. R. Miller, superintendent of utilization, Portland Gas and Coke Co. This paper brought out, among other points, that efficient utilization of oven fuel can only be had when the ovens are used to full capacity; also that gas gives the most efficient heat, in multiple oven installations, in that all ovens are at the same temperature rather than some being too hot and others too cold. Mr. Miller's paper will be found on Page 10.

The paper by Northbert Fratt, credit manager, Seattle Gas Co., "A Sales Slant on Credits and Collections," demonstrated that credit men and salesmen have mutual interests, and should be trained in each others problems. An abstract of this paper appears on Page 16.

"Dressing Up the Gas Business" was the next topic, led by B. H. Parkinson. A number of possible improvements were discussed, such as enameled or plated vents for gas ranges or, better still, concealed vents; gas outlets concealed in flush-mounted or neat boxes in base board; base board refrigerator connection, rather than floor puncturing, preferably flexible or at least easily disconnected; attractive finish on such appliances as furnaces and water heaters.

"Telling the Public About Gas" was the next topic, introduced by a paper written by A. C. Joy, manager publicity and advertising, Pacific Gas and Electric Co., and read by Douglas Buckler, supervisor of advertising and publications, Southern California Gas Co. and chairman of the P.C.G.A. Publicity and Advertising Section. This paper led to a discussion of the infra-red radiant heat produced by radiant fires and other similar gas burning equipment, the beneficial effect of these rays, and the possibility of making this a major sales effort. It was brought out that these appliances are widely advocated and used in Great Britain. The prevailing opinion was that the healthful property of radiant heat was a great promotional possibility, but that careful research should precede extensive sales efforts built around this theme.

Immediately before adjournment an unexpected and delightful addition to the program was introduced when Paul B. McKee, by personal letter, invited all visiting delegates to be his guests at an informal luncheon at the Arlington Club. This event added the finishing touch to the overwhelming hospitality extended to all delegates.

Dealer Cooperation

The second afternoon was devoted to an open forum on the general subject of dealer cooperation. It was opened by H. M. Crawford, under the heading "The Importance of the Dealer," and proved to be a very frank and forceful discussion in which the points were made that dealers constitute a great numerical and potential force which the gas industry cannot afford to overlook and neglect; and that utility-dealer relations should be along strictly business lines.

This was followed by a paper on "Cooperative Sales Efforts" by Douglas Buckler, which gave interesting aspects of recent cooperative campaigns and dealer organization in Southern California, where the three companies headquartering in Los Angeles are carrying on some very successful activities uniting their own and dealer efforts.

"Employee Selling" was introduced by B. H. Parkinson, who described in detail the employee sales campaign inaugurated by the Portland Gas and Coke Co. and carried on with great success.

C. A. Swigart, trade relations representative, Pacific Coast Gas Association, next presented a paper entitled "The Trade Relations Program of the Pacific Coast Gas Association." The general object of this trade relations program was initially to recommend to each gas utility company the desirability of its seriously considering the coordination of appliance sales activities in its particular territory with dealers and manufacturers, possibly through the organization of some sort of gas appliance association. Such a program develops slowly, and numerous difficulties were encountered so that, in March, 1932, a field representative was appointed, at first in conjunction with the Pacific Coast Electrical Bureau and then, after May, 1933, wholly assumed by Pacific Coast Gas Association.

The first work of this field representative was a fact-finding survey of the appliance sales policies and practices of the utility companies operating in California, Arizona and Nevada. This survey disclosed a lack of uniformity, an insufficient understanding of the factors underlying and comprising the dealer problem, and an insufficient training of utility personnel in their own merchandising policies. Following this survey, an intensive campaign of employee education was inaugurated, in connection with which the field representative held meetings of the sales forces in most of the districts.

Paralleling this work, the field representative was establishing contacts with the several dealer groups and associations, and extending the educational program into these organizations.

Since the inauguration of the N.R.A. all of the gas appliance industry has been brought under the jurisdiction of a national code, with the field representative as the Pacific Coast representative for the Code Authority. While it is too early to predict the results of this new activity, it has been undertaken with the idea and in the hope that through it the several branches of the industry may be more closely correlated, and that by this means the aims and objects of the Pacific Coast Association in its trade

(Continued on Page 36)

COMMITTEE:
DOUGLAS BUCKLER...SO. CALIF. GAS CO.
J. EARL JONES.....SEATTLE GAS CO.
A. C. JOY (CHAIRMAN).....P. G. & E.
D. L. SCOTT.....L. A. G. & E. CO.
PIERRE VINET.....C. C. G. & E. CO.

1934 P·C·G·A

HEADQUARTERS:
PACIFIC COAST GAS ASSOCIATION
447 SUTTER STREET, SAN FRANCISCO

GEO. P. EGLESTON, PRESIDENT
CLIFFORD JOHNSTONE, MNG. DIRECTOR

CO-OPERATIVE LOAD-BUILDING MONTHLY NEWS ..... AND VIEWS

Southern California Subjects for Coastwide Campaign

℞
CLEANLINESS,
COMFORT, ECONOMY
Dr. Architect
Spotless as a model ward! Efficient as a modern operating room! Automatically-controlled gas-fired boilers of Foster Memorial Hospital
"Dr." Architect and Dr Medico are allies in the modern health crusade.
Such model institutions as Foster Memorial Hospital stand as monuments to their professional cooperation.
The entire building is automatically heated by two gas-fired, low-pressure boilers. Two high-pressure boilers supply steam for sterilization. Gas automatic water-heaters assure abundant hot water at any hour, day or night.
The kitchen, too, with its heavy-duty restaurant ranges and other modern appliances, is "all gas."
Three years' experience with gas fuel is summed up by Superintendent Gertrude W Fuller "These automatic gas appliances have assisted materially in reducing our operating costs. The full time of the engineer is not required, and he may be assigned to other duties. In every way, gas is giving wonderful satisfaction."
A fuel that meets exacting hospital requirements is a fuel you can depend upon for client satisfaction! In planning for gas installations, or writing specifications for any building, you are invited to consult (without charge) your gas company's Industrial Engineers
Quick Clean Economical Gas the modern fuel
PACIFIC COAST GAS ASSOCIATION
447 SUTTER STREET SAN FRA
FOSTER MEMORIAL HOSPITAL
Ventura, California
Architect
JOHN C. AUSTIN
Los Angeles
General Contractors
BAVIN & BURCH COMPANY
Los Angeles
Plumbing, Heating Contractors,
JONES HEATING CO
Pasadena

"BOOSTERS" for GAS
One of America's largest processors, manufacturers and distributors specializing in nuts and nut candies "L. A. Nut House" has expanded in three years, from 2,400 to 30,000 sq. ft. of floor space, in addition to its 6-story warehouse, covering 36,000 sq. ft.
Installing many costly units of new equipment, Lewis Stone, purchasing agent, and Sell Gendel, factory superintendent, have specified gas, the modern fuel for every requirement from peanut roasting to candy cooking.
"Gas fuel," all executives of this big concern agree, "has had an important part in making 'LA-NUT' products favorably known throughout the West. Other fuels have been tried, but never has proved as clean, economical, and efficient as gas."
Quick Clean Economical Gas the modern industrial fuel
factory of LOS ANGELES NUT HOUSE
Gold, proprietors.)
Gas Company's INDUSTRIAL ENGINEER will gladly study your fuel problems and submit a report without charge
447 Sutter St., San Francisco
INC. (a non-profit service organization of which your gas company is a member)

CLEAN AND BUSY
ST. PAUL DYE WORKS
For 30 years, Santa Barbara (California) homes have been served by these progressive French Dry Cleaners and Dyers.
A plant that makes a keenness of cleaning must make cleanliness its business
"Cleanliness," says Mr. G. H. Merritt, manager of Santa Barbara's St. Paul Dye Works, "plays a most important part in our success.
"That is one reason why we use modern gas fuel; it is free from smoke, soot and other disagreeable features. We are so pleased with the results obtained with gas that we feel it our duty to tell others, in order that they may benefit by our experience."
It is not just a coincidence that the necessity of busy, successful plants use quick, clean, economical gas! Ask your gas company about changing to this modern fuel. A consultation costs you nothing
Quick Clean Economical Gas the modern industrial fuel
ASSOCIATION, INC. (A non-profit service organization of which your gas company is a member) 447 Sutter St., San Francisco

MBER "GOES MODERN"
O PROSPERS
ART AND BUSINESS MERGE
in display rooms of Earl O. Stice Company, Eagle Rock (L. A.) plumbers and appliance dealers.
Earl O Stice establishment apart from
s the feminine touch (Mrs. Stice has
ties in favor of active participation in
and says it's much more fun.")
ring this attractive store, are charmed
impressive number of Stice-installed gas ranges
ter heaters, refrigerators and other modern gas appliances
Appliance-sales and contracting are featured almost to the exclusion of "jobbing" Water heater sales normally average 7 to 10 weekly often resulting from home follow-up (by the "outside" sales-staff) of prospects who call at the store
In nine out of ten cases, a sale is made by obtaining the name and address and asking to see the old appliance
"It is far more profitable to sell good appliances than cheap ones," says Mr Stice, "and far easier to keep them sold. Too many plumbers jeopardize their own future by installing water heaters of low quality, or too small for the customer's needs and by trying to repair old wrecks instead of making sales."
Stice confirms the opinion of other leading plumbers who have adopted modern merchandising methods in cooperation with the Gas Companies
"That's where the profit is today!"
Quick Clean Economical Gas the modern fuel
PACIFIC COAST GAS ASSOCIATION, INC.
(A non-profit service organization of which your Gas Company is a member)
447 SUTTER STREET, SAN FRANCISCO, CALIFORNIA

This month we reproduce (in miniature) advertisements representative of Southern California industrial gas-users and appliance dealers. These are now appearing in leading trade journals of Coastwide circulation, along with ads featuring testimonials from Northern California and the Pacific Northwest.

FOSTER MEMORIAL HOSPITAL, VENTURA—This advertisement appears (in full-page and 2/3-page space) in five publications read by architects, engineers, contractors and builders.

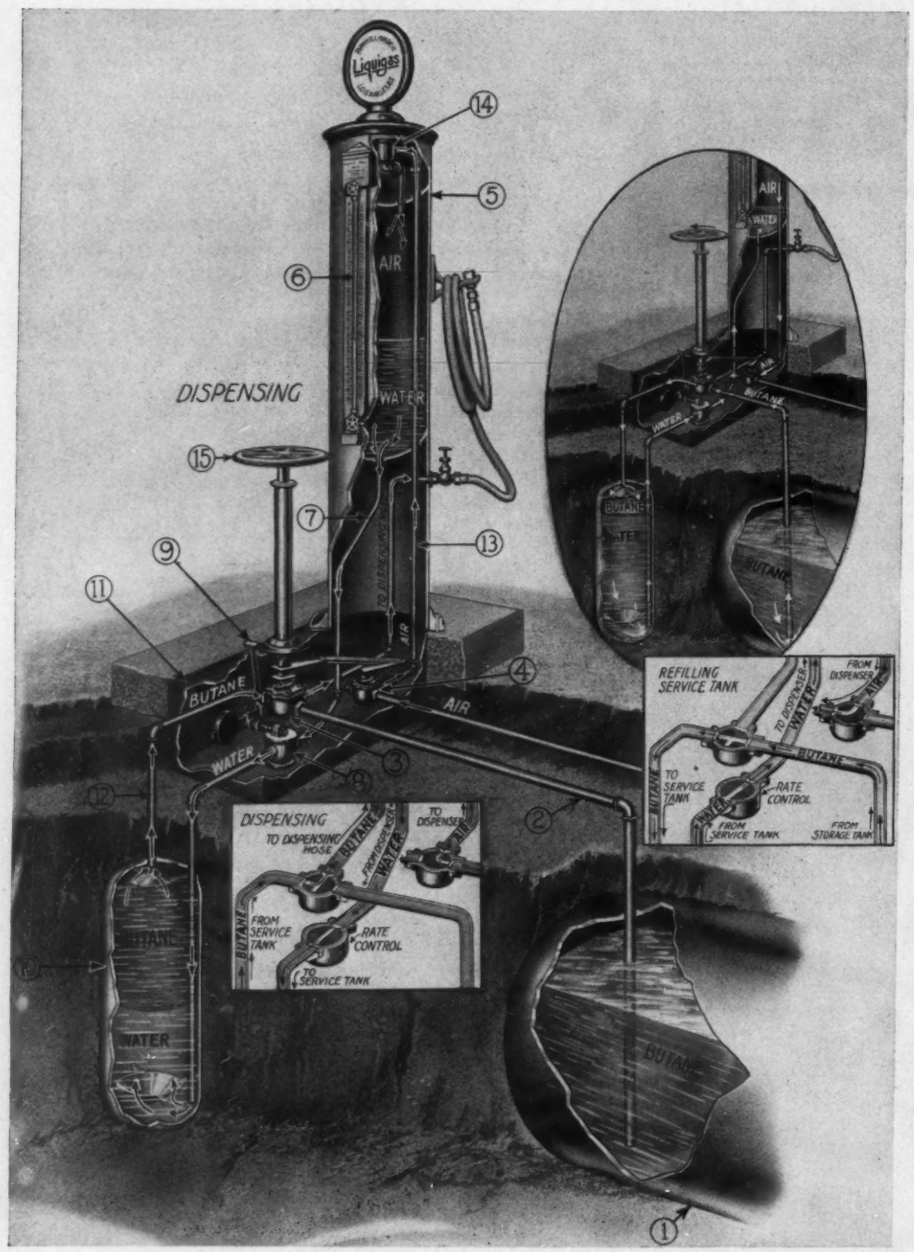
ST. PAUL DYE WORKS, SANTA BARBARA—"Clean and Busy" says the headline, to readers of "Pacific Laundry Journal & Dry Cleaner."

LOS ANGELES NUT HOUSE—One of America's largest processors and manufacturers of nuts and nut candies. Executives are all "Boosters for Gas."

EARL O. STICE CO., EAGLE ROCK—This plumber "Goes Modern and Prospers"; an example of gas-appliance merchandising success (Western Plumbing & Heating Journal).

BUTANE • PROPANE NEWS

Vol. 4, No. 7 July, 1934



Courtesy of Petroleum World

Service Station Dispenser for Butane

THE use of butane-propane mixtures for automotive fuel for certain applications to heavy trucks and buses is now a proven commercial success. The gradual growth of such applications has created a demand for a dispensing and measuring device, to serve the same purpose in servicing butane-fuelled vehicles as the service-station "pumps" fulfill in handling gasoline. In general, the requirements for such a device for dispensing butane are the same as those for the usual gasoline dispensing pump; that is, accurate measurement of the volume of liquid dispensed, and adequate safety features to insure against excessive spillage or escape of the fuel, either during the filling operation or while the equipment is idle. In the case of the butane dispenser, the problem is complicated somewhat by the fact that the butane must be stored and handled under pressure.

One solution of this problem is offered by the butane dispenser described in this article. The device is the result of development work extending over the past nine months, and a dispenser exactly like that described has been in successful operation, servicing butane-fuelled trucks and a few experimental private cars, for about four months. Another installation is now being made, and several more are in prospect.

The cutaway drawing shows the complete set-up of underground butane storage tank and dispenser, and indicates the method of operation of the dispenser. The scheme of operation is as follows:

A measuring tank (5), equipped with an accurately calibrated and thoroughly guarded gauge glass (6), is mounted on a steel box (11), the whole being set in concrete. A pipe (7) runs from the bottom of the measuring tank to the bottom of the underground displacement tank (10), through the weight-closed valve (8) which may be opened by pushing down on the guarded foot-treadle (9). During delivery of butane into a vehicle fuel tank, water in tank (5) is forced into tank (10) by means of air pressure applied to the top of tank (5); this water displaces butane out of the top of tank (10) through pipe (12), 3-way valve (3) and delivery pipe (13) to the hose which makes the connection with the fuel tank. The rate of flow and amount of water

forced into the displacement tank is under the instant control of valve (8), which is manipulated by the operator's foot while he watches the level in the gauge glass. Compressed air for forcing the water out of tank (5) is taken from the station air supply through 3-way valve (4), and delivered into the top of tank (5).

After a delivery of butane equal to the gauged capacity of tank (5) has been made, the dispenser is prepared for another delivery by shifting both 3-way valves (3) and (4) to their opposite positions, which simultaneously vents the compressed air in the top of tank (5) to the atmosphere and shuts off the air supply, shuts the connection between pipe (12) and the delivery pipe (13), and instead connects pipe (12) to the bottom of the main butane storage tank (1) through the pipe (2). The simultaneous shifting of valves (3) and (4) is accomplished by linking them together, and operating them through the hand-wheel (15); only a quarter-turn of the wheel is required to shift the valves into either position.

With the valves in the refilling position as just described, the air pressure above the water in tank (5) is removed, and hence the vapor pressure in the storage tank will now force butane over into the displacement tank, displacing water out of it into the measuring tank when valve (8) is opened by stepping on the treadle (9). The displacement tank is refilled in this way until the water in the measuring tank reaches the top or zero gauge mark; valves (3) and (4) are then shifted back into the original positions by giving the hand-wheel a quarter-turn in the opposite direction; the dispenser is then ready for another delivery.

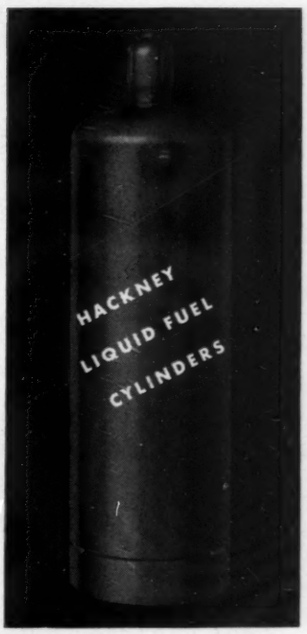
The positions of the ports in the control valves while the device is in the dispensing or delivery position are shown in the insert in the center of the picture; the corresponding positions when refilling the displacement tank are shown in the insert to the right.

In case the water control-valve (8) should leak while the equipment is standing idle with the 3-way valves in the refilling position, tank (5) might continue to fill up and vent water, and finally butane, through valve (4). This possibility is guarded against by means of emergency float valve (14) in the air line; when liquid reaches this valve, further outflow is positively stopped.

Two features, not shown on the drawing in order to save confusion, are automatic means for preventing escape of butane in the event of a hose failure, and a bleeder line for determining occasionally whether the water in the displacement tank is operating between proper limits. Permanent connections, with a telltale bleeder valve to detect leakage, are provided for replenishing the water in the system when and if necessary.

It was anticipated that trouble might be experienced in the operation of this device due to contamination of the butane with water, and an elaborate pressure chamois strainer was developed to take care of this. However, it has been found that with adequate reserve volume in the displacement tank, above and below the top and bottom operating limits of the butane-water interface, no such contamination occurs. Three large trucks have serviced from the dispenser continuously ever since it was placed in operation without any sign of trouble from water.

DOMINATES THE FIELD!



Remember this—THERE ARE TWICE AS MANY — Hackney Liquefied Petroleum Gas Cylinders in service — as all others combined.

Hackney users include such leaders as — Standard, Shell, Phillips, Hope, Skelly, etc.

Hackney has built cylinders for Butane, Propane and Butane-Propane mixtures since they were first developed.

The superior design and construction features of Hackney Liquefied Petroleum Gas Cylinders have gained for them such wide acceptance that they dominate the field by two to one.

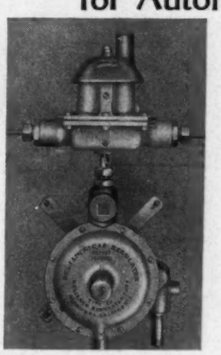
PRESSED STEEL TANK COMPANY

208 S. La Salle St. Bldg., Room 1185, Chicago, Ill.
1363 Vanderbilt Concourse Bldg., New York, N. Y.
6633 Greenfield Ave., Milwaukee, Wis.
666 Roosevelt Bldg., Los Angeles, Calif.

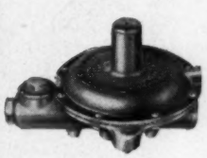
Hackney
MILWAUKEE

CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

RELIANCE REGULATORS
for Automatic Control of Bottled Gas Fuels



Type MR
Patent No. 1960466



On the left is illustrated the spring loaded, canopy type MR Regulator with a secondary type BK Regulator. Above is illustrated the BK secondary type Regulator.

Reliance liquid petroleum gas regulators are recommended in duplex operating types for the best results. The primary MR regulator reduces extremely high pressures encountered in the service cylinder when first intalled to an intermediate pressure of from 3 to 10 pounds. The BK regulator then reduces this pressure to a uniform outlet pressure required for proper utilization which insures uninterrupted service to the appliances. The BK regulator can be operated independent of a primary regulator when manifold valves are employed.

Write for Bulletin No. 30 explaining in detail all types of Reliance Regulators and accessories designed for bottled gases.

RELIANCE REGULATOR CORPORATION
1000 Meridian Avenue
Alhambra California

BUTANE

Fuel of the Future

BUTANE is an efficient, economical substitute for manufactured gas, natural gas, and electricity for domestic and industrial uses, including heat-treating, cutting, welding, refrigerating. The perfect fuel for rail motor cars, busses, trucks, stationary engines.

Investigate By Requesting Engineering Data and Complete Details

BUTANE SALES CO.

Pioneers in Butane Development

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San Francisco
SUtter 5678

973 North Main
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SCAIFE

CYLINDERS

FOR LIQUEFIED PETROLEUM GASES

•

MANUFACTURED IN ACCORDANCE TO I. C. C. SPECIFICATIONS

•

CAPACITIES TO MEET CUSTOMERS REQUIREMENTS

•

Founded 1802

• • •

WM. B. SCAIFE & SONS CO.

OAKMONT, PENNA.

NEW YORK PITTSBURGH CHICAGO

The advantages which this dispenser offers are:

Rapid delivery: Rates of 20 to 30 gallons per minute can be handled easily.

Accurate measurement: The measurement is as accurate as it is possible to read the gauge-glass scale, regardless of fast or slow filling rates.

Fixed maximum pressure: The dispenser can deliver no more pressure than the pressure of the air supply, which is controlled to any desired point in excess of the vapor pressure of the butane itself.

Safety: No butane is stored above ground, even temporarily, and automatic features, such as the "dead-man" operation of the water-rate valve, emergency overfill shut-off, hose-burst protection, etc., guard against all likely contingencies.

Ease of operation: All functions are controlled by the hand-wheel and foot-treadle.

This equipment has been developed and placed on the market by Parkhill-Wade, Incorporated, 973 No. Main St., Los Angeles, Calif.

Needles Gas & Electric Co. Now Serving Butane-Air

Needles Gas & Electric Co., serving oil gas in Needles, Calif., went on butane-air gas service about the middle of June, according to James A. Ward, president of the company. It is believed that Needles is the first community where butane-air has been substituted for oil gas without appliance adjustment for the new gas.

The butane-air gas mixture used in Needles will have a heating value of from between 800 and 900 B.t.u. Three "Gasair" mixers supplied by the Utility Development Co., San Francisco, of which John K. Heller is president, is producing the new gas at Needles. The vaporizers have been submerged in the hot well of the water cooling system for the diesel engines which drive the company's electric generators. By this device the butane assists in cooling water for the generator. D. E. York, construction engineer for Needles Gas & Electric, was in charge of installing the butane-air equipment. The company serves about 500 gas customers at Needles.

Bottled Gas for Buenos Aires Through Argentine Government

Argentine Government Oil Fields, controlled by the Argentine Government, has recently begun distribution of liquefied petroleum gas in Buenos Aires, Argentine, S. A. It is reported that approximately 1000 domestic installations were made during the first three months of operation. Purchase of the installation equipment by the consumer is not required, but a $1 per month rental charge is made for its use. Distribution is handled directly by the government agency, no dealers having been appointed.

N.R.A. Approves Gas Appliance Cost Accounting System

On June 7 National Recovery Administrator Hugh S. Johnson approved a uniform method of cost accounting for the gas appliance and apparatus industry as submitted by the industry's code authority in accordance with the provisions of the code.

"The Most Modern Gas Kitchen on Wheels" uses bottled gas.

Rockgas-Equipped Kitchen Touring Hawaii and Orient

A TRAVELING kitchen, known as "The Most Modern Kitchen on Wheels" is now on a tour through Hawaii, the Philippines and the Orient in connection with the E. K. Fernandez show. It is Rockgas-equipped for the operation of a 9-foot Electrolux refrigerator, a Wedgewood clock-controlled range, an ice cream cabinet and popcorn machine. The appliances are operated from one 20- by 48-inch cylinder which has a net capacity of 210 pounds of Rockgas. The tank is installed in front of the truck near the driver's compartment.

The kitchen was equipped with Rockgas and gas appliances by the Honolulu Gas Co., Ltd., which is distributor for Rockgas in the Hawaiian Islands. Pictures shown above come from Fred Rich, sales manager of the Honolulu Gas Co., and are furnished *Western Gas* through the courtesy of Imperial Gas Co., Los Angeles, headquarters for Rockgas distribution.

I. C. C. Hearing on Trucking of Inflammables

A hearing on the advisability of giving the Interstate Commerce Commission jurisdiction over the transportation of inflammables by truck was held June 6 at Washington, D. C., at which time a set of proposed rules regulating such practice was presented.

The National Fire Protection Association is also preparing a similar set of regulations, but they are expected to be almost identical in wording with those proposed for I.C.C. administration.

Bulk Station at Liberty, N. Y.

A bulk station for distribution of bottled gas has been built and put into operation at Liberty, N. Y., by Geroe & Francisco. This feed and coal firm has added bottled gas to its line to offset the drop in coal sales caused by the intensive development of bottled gas activities in its locality.

Revision In Rules Affecting Containers

THE recently published 1934 edition of the regulations of the National Board of Fire Underwriters for the Design, Installation and Construction of Containers and Pertinent Equipment for the Storage and Handling of Liquefied Petroleum Gases contains a number of revisions adopted by the National Fire Protection Association at its annual meeting in May. The principal changes* are as follows:

Class A containers, which were formerly required to be designed for not less than 75 lbs. per sq. in. gauge and which were allowed for products with a vapor pressure at 100 degrees F. up to this amount, are now required to be designed for not less than 80 lbs. per sq. in. gauge and are permitted for use with products having a vapor pressure at 100 degrees F. up to this amount.

For the construction of containers, reference is now made to the recently developed A.P.I.-A.S.M.E. rules for the Design, Construction and Repair of Unfired Pressure Vessels for Petroleum Liquids and Gases, as well as to the rules for the construction of Unfired Pressure Vessels in the A.S.M.E. Boiler Construction Code. Containers constructed in accordance with either of these rules or in accordance with the rules of the State in which the vessel is to be installed, provided such rules are in substantial conformity with the above mentioned rules, are now permitted.

In addition to the markings previously required, containers are required to have a marking signifying compliance with one of the construction codes mentioned or to have the stamp of the National Board of State Boiler Inspectors, also to be marked with the working pressure in pounds per square inch gauge for which they are designed and the thickness of the shell.

The requirement that discharge pipes must be connected at the top of containers has been omitted.

Each container is required to have a suitable pressure gauge.

The table of required sizes of safety valves has been revised and expanded and each safety valve is required to be marked with its free discharge area and the pressure at which it is set to operate.

*Summary of changes was prepared by H. E. Newell, chairman N.F.P.A. Committee on Gases. Prepared for "Butane-Propane News" through courtesy of Robert S. Moulton, Technical Secretary, N.F.P.A.—*Editor.*

KEROTEST

PROPANE MANIFOLDS

DIAPHRAGM PACKLESS

Forged brass construction of valve body and bonnets assure 100% safety and control at any pressure . . . specially formed triple metal diaphragm insures proper flexing in all positions . . . convenient location of lever handle gives fingertip control of Bottled Propane Gas . . . a most efficient unit designed especially for propane service.

Write for Circular W describing this and other Kerotest Forged Brass Products for Propane Gas Service.

KEROTEST MFG. CO.
PITTSBURGH, PENNA.

KEROTEST

Sungas Co. Formed to Operate in Miami Territory

The Sungas Co., 1701 N. W. 7th Avenue, Miami, Fla., has been organized to distribute bottled gas in the district surrounding Miami. The officers of the company are George Langer, president; William Mankes, vice-president; Benjamin Coser, secretary-treasurer. These men have previously been active in developing bottled gas operations in Sullivan County, N. Y., where they still retain their company holdings.

C. G. M. A. Summer Meeting Held at Absecon, N. J.

The Compressed Gas Manufacturers' Association held its summer meeting June 14-16 at the Seaview Golf Club, Absecon, N. J. The meeting was primarily of a social nature, and, according to F. R. Fetherston, secretary-treasurer, the brief business session was limited to receiving committee reports and to approving minor changes in the by-laws of the association.

A. E. Higgins Visiting Pacific Coast Gas Companies

Capt. A. E. Higgins of the American Gas Association arrived in Los Angeles by plane with Mrs. Higgins on June 13 from Dallas, via El Paso. Capt. Higgins went on to Portland for the Northwest Conference of the Pacific Coast Gas Association, spending two weeks contacting Northwest companies. He will return to Los Angeles about July 6, spending some time with natural gas companies in that section in connection with his work as secretary of the A.G.A. Natural Gas Department.

Kettleman Cooling Tower Is Now Operating

The latter part of June Southern California Gas Co. placed its new cooling tower at Kettleman Hills in operation. The tower is located at the outlet of the Kettleman Hills measuring station, and it is designed to remove water vapor from all the gas taken by the company in that area. It operates at 400 pounds pressure, maintaining a gas temperature on the discharge between 70 and 80 degrees, depending upon humidity and atmospheric temperature conditions.

MEASUREMENT and CONTROL

Metering a Fluctuating Load

By M. E. Carrico
*Southern California Gas Company**

IN MEASURING industrial gas with an orifice meter we are confronted at times with the problem of measuring a very small flow, in relation to a high maximum load. This low load usually occurs at night, or over the week-end.

M. E. Carrico

One particular plant where this problem existed was using fuel oil for its boilers, due to the extremely low price of fuel oil, but was paying the minimum charge for standby gas service. During the last two days of the billing period, the plant utilized the volume of gas covered by the minimum charge, if no emergency had arisen during the month.

The boiler load required approximately 35,000 cubic feet per hour. In the shops approximately 300 feet per hour was also used for several small furnaces.

We had made numerous tests periodically between 8 A.M. and 4 P.M. with a 6 x 0.250 disc, to determine the furnace consumption. During these tests it was necessary to watch operations very closely so that we could switch the load back to the large disc instantly, in case the boilers were switched over to gas for fuel.

The method developed for handling the measurement problem in this plant is very simple and the cost of the equipment and installation is small.

A small by-pass line is run from the service of the orifice meter to the consumer's house line, at a point just beyond the large regulator on the outlet end of the orifice meter set-up. In the by-pass line is installed a high pressure regulator, or two high pressure regulators if the main line pressure is sufficiently high to require it to obtain the best operation. On the discharge side of the regulators, a high pressure meter of the proper working pressure and capacity is installed. A 7-day recording pressure gauge is installed to record the working pressure on the meter. Just beyond the meter a small orifice made out of heavy galvanized sheet iron is installed in a flange union.

The purpose of this disc is to restrict the flow through the positive meter so that it cannot possibly be overloaded, and at the same time will have ample capacity to pass the volume to be measured.

The regulator controlling the pressure to the positive meter is set at a pressure 5 pounds higher than the pressure delivered by the large regulator on the outlet end of the orifice meter set-up.

When the heavy load goes off, the positive meter pressure, say 13 lbs., builds the pressure on the house line up from say 8 lbs. to 13 lbs., causing the large regulator to lock up, and shut-off all flow through the orifice meter. The low flow is then measured through the positive meter.

When the heavy load comes on again, the pressure on the house line is pulled down to 8 lbs. The large regulator then opens up and the gas again passes through the orifice meter. Now the positive meter will pass continuously the amount of gas permitted by the small disc installed in the flange union just beyond the positive meter.

The volume of gas passed by the positive meter is computed for the regular billing period, and added to the volume measured by the orifice meter.

Fig. 1 presents a rough sketch of the layout for this installation.

*Presented before the Southern California Meter Association, May 24, 1934.

Wilde Heads S.C.M.A. for Ninth Year

A NEW panel of officers heads the Southern California Meter Association, as a result of elections at the June 28th meeting, held at the Lakewood Golf Club, Long Beach, Calif.

Edgar Wilde of the Southern Counties Gas Co. will lead the S.C.M.A. as president during its ninth year, supported by the following officers and committee chairmen who together comprise the board of directors.

Vice-president, F. E. Bradley, Chanslor Canfield Midway Oil Co.

Treasurer, B. G. Williams, Southern California Gas Co.

Secretary, G. S. Duncan, General Petroleum Corp.

Committee Chairmen: Program, Gurney B. Reece, Southern Counties Gas Co.; Entertainment, Frank Colton, Associated Oil Co.; Membership, George H. Forster, Texas Co.; Standards, W. C. Dayhuff, Standard Oil Co. of California; By-Laws, J. C. Groenewegen, Shell Co.; Publications, G. H. Finley, Western Gas.

Edgar Wilde

Officers and committee heads named above were nominated by a committee of which R. F. Angell, Union Oil Co., was chairman, and were elected by unanimous ballot.

Program arrangements for the June meeting featured a paper by W. L. Cowan of the Union Oil Co., summarizing recently

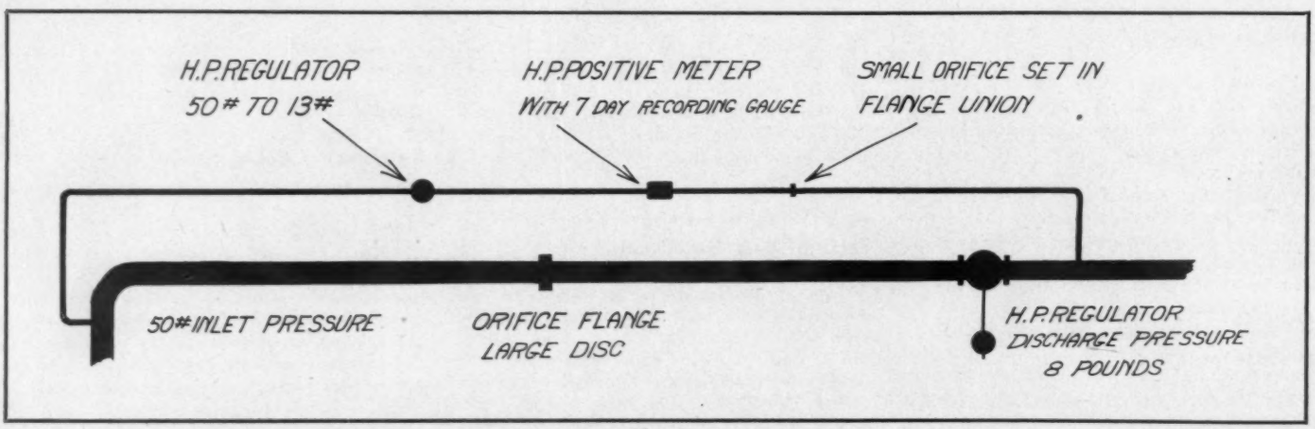


Fig. 1

published new data affecting orifice meter measurement, coordinated and supplemented by the author. Determination of orifice meter coefficients by means of the Reynolds number, application of the expansion factor as developed by the U. S. Bureau of Mines, various type flanges as related to coefficients, were among the topics touched in this comprehensive discussion, which will be published in an early issue.

Brief discussion bearing on the standard gas sample recently recommended by the S.C.M.A. was next in order, participated in by B. G. Williams and P. W. Hill.

Program Chairman F. E. Bradley, conducting the meeting in the absence of President C. B. Heartwell, turned the chair to President-Elect Wilde who introduced his fellow board members, following which the meeting adjourned.

The July meeting program will be sponsored by the Foxboro Co.'s Los Angeles office, of which D. M. Hill is manager.

Commercial Cooking and Baking

(Continued from Page 10)

satisfactorily and conveniently on the gas griddle or plate. Our experience indicates that the heating requirement of the gas appliances used in conjunction with oil is often as much as 40 per cent of the total consumption.

Considering the matter from the standpoint of gas replacing the oil installation in our example, it will be seen that only about 60 per cent of the load need be replaced by gas, since ordinarily close to 40 per cent of the cooking load is taken care of by the gas auxiliary appliances which are more adaptable in handling certain classes of food.

In replacing the oil range with modern gas appliances the B.t.u. consumption for a given load will be reduced to approximately 50 per cent of that required with oil. This means that the total heat consumption for the entire installation will be reduced to approximately 70 per cent of that required when the oil range was in operation, for the same load conditions. At the same time the cost per thousand cubic feet on the remainder of the load is also reduced. We have found with 570 B.t.u. manufactured gas, when taking these points into consideration, that a 50c rate per thousand will compete with diesel oil at 5c per gallon.

Auxiliary gas-fired appliances may easily be recommended and economically used to a point where 40 per cent of the conventional commercial kitchen load can be absorbed. This once accomplished places the industrial salesman in an advantageous position to encourage conversion or replacement of the major oil or solid fuel fired appliances, since such additional consumption generally earns attractive tariff rates.

The fuel cost is actually a minor item in the preparation of foodstuffs. The difference in quality of goods obtainable with gas equipment will generally outweigh any possible difference in fuel cost of operation even if the gas is not directly competitive. There is no question but that there are many intangible considerations favorable to gas from a convenience, cleanliness, and general operation standpoint. The satisfaction of the chef and cooks in having more convenient equipment and more comfortable working quarters is worth far more to the thoughtful manager than any fuel cost consideration, for after all his prime consideration should be good food and good service for the patrons.

Bakeries

The same line of reasoning illustrated above also will apply, to a certain extent, to bakeries, both large and small. A study of load conditions often will reveal that because of the flexibility required in this class of work the application of heat usually is not made to the best advantage with crude fuels. B.t.u. consumption per pound is, of course, much higher than is the case with gas.

In light bakery work it is more a question of suitable appliances than a question of thermal efficiency. Fuel consumption per pound of goods may be doubled in cases where improperly selected appliances are utilized. It is usually a difficult matter, in a small bakery, where the product is largely pastry of many varieties, to properly utilize a heavily constructed single hearth oven designed for crude fuels.

There is a variety of temperature required in this class of work during the same time interval and a very flexible multiple hearth type of oven is required. With automatic gas-multiple-compartment ovens the appliances may be operated to suit the load condition and in the amount required. In this type of shop, that is, where light goods in a large variety are produced, gas has a distinct advantage because of its flexibility and low grade fuels find it hard to compete even though cost from a B.t.u. standpoint may be considerably lower.

In the larger bakeries the picture may be somewhat different. Conditions may be more favorable to oil and other fuels than in the smaller shop. While there may be no question even in the minds of the operators that gas is superior to other fuels for baking, and, while the owner of any well organized bakery will readily admit that his total cost for heat, light and power will probably not exceed 3½ per cent of his total operating cost, and that his gas fuel cost, with manufactured gas, probably will not exceed 1½ to 2 per cent of his total operating cost, yet it behooves the gas man to consider all the conditions and possibilities relative to the bakery industry; whether in considering the replacement of other fuel or from the standpoint of holding business already obtained. It is well to make a careful survey of all conditions and factors affecting possible fuel economies.

We may make a broad statement that gas is a much more satisfactory fuel than oil, electricity, or wood, but the fact remains that if our gas appliances and equipment are not operating in the best possible manner we are subject to complaint and criticism.

Heat consumption in different plants turning out approximately the same amount of goods per day may vary widely. Consumption per pound of baked goods may vary from 425 B.t.u. or, 0.75 of a cubic foot of manufactured gas to 800 B.t.u., or 1.4 cubic feet of gas per pound for the same amount of goods and the same class of work. This variation is due primarily to the condition of the appliances and to the load condition or load factor.

An actual survey and rearrangement of baking load, made in connection with a gas fired traveling oven handling from 10 to 15 tons of bread a day, resulted in a decrease in consumption per pound from 1¼ cubic feet of 570 B.t.u. gas to 0.88 of a cubic foot of gas, a decrease of 32 per cent. This was accomplished principally by eliminating gaps in the baking load and by arranging oven loading so that baking was accomplished in approximately two-thirds of the time previously required. This work, of course, was done with the cooperation of the baker and proprietor.

This alone shows the possibilities of a careful survey from the standpoint of fuel economy and preventing competition from making inroads on our present load.

Fig. 2 represents a load curve for traveling ovens, and what applies to traveling ovens again applies to most any commercial baking equipment. Incidentally, the savings as the load approaches capacity are even more pronounced in labor saving than in the actual reduction of oven operating costs.

In conclusion, I should like to see the sentiment prevail among those directly interested that gas has many natural advantages in the hotel, restaurant and bakery field, and these advantages should be capitalized to our benefit, particularly in the area where manufactured gas is served. Manufacturers of commercial gas appliances have made some very pronounced improvements in their appliances within the past two years, both from a utilization and appearance standpoint. We are in a position, I think, to boldly claim a superior fuel, superior equipment, and superior service. Let us live up to our possibilities.

Payne and Bailey Attend Appliance Code Sessions

ElRoy Payne of the Payne Furnace and Supply Co., Beverly Hills, Calif., member of the Code Authority for the Gas Appliances and Apparatus Industry, and W. J. Bailey of the Day and Night Water Heater Co., Monrovia, Calif., administrative representative for the Code Authority, water heater division, for the Pacific Slope States, attended sessions of the Code Authority held June 19 at the Chicago offices of the Gas Appliances Institute.

American Home Economics Association Holds Annual Convention in June

The annual convention of the American Home Economics Association was held June 25-29 at the Pennsylvania Hotel in New York City.

Consolidated Gas Co. of New York, Brooklyn Union Gas Co., and the Brooklyn Borough Gas Co., cooperated with the American Gas Association in an exhibit of a modern gas kitchen, in charge of home service directors of the individual companies.

TABLE NO. 3. SAVING DUE TO VARYING THICKNESS OF INSULATION ADDED TO WALL OR ROOF HAVING CONDUCTANCE OF .27 INSULATION

Thickness of Insulation	Loss per Day per Degree (Therms)	Cost of Insulation (Dollars)	Heat Loss Max. Hour (Therms)	Saving Max. Hour (Therms)	Saving per Day per Deg. (Therms)	Saving Heating Plant Cost (Dollars)	Net Cost Insulation (Dollars)	Annual Operating Cost (Dollars)	Annual Operating Saving (Dollars)	Per Cent on Gross Cost (Dollars)	Per Cent on Net Cost (Dollars)
None	.065		.189					$43.00			
1 in.	.032	$ 64.00	.094	.095	.033	$45.00	$19.00	21.50	$21.50	33.6	113.
2 in.	.022	102.00	.063	.126	.043	61.00	41.00	14.30	28.70	28.1	70.
3 in.	.016	140.00	.047	.142	.049	68.00	72.00	10.70	32.30	23.1	44.8
4 in.	.013	178.00	.038	.151	.052	72.00	106.00	8.60	34.40	19.3	32.4
6 in.	.009	255.00	.027	.162	.056	76.00	179.00	6.10	36.90	14.5	20.6

CALCULATIONS summarized in this table are based upon rock wool or equivalent insulation with a conductance of .27 B.t.u. per sq. ft. per degree per hour for 1 inch thickness. 10 lbs. per cu. ft., price $80 per ton; fuel 10 cents per therm; overall fuel efficiency 68 per cent.; degree days 4,500; maximum hour is based on 0 to 70°; all figures are for 1,000 sq. ft. Labor and other expenses of placing insulation has been taken at 3 cents per sq. ft. for 1 inch thickness and one-half cent added for each additional inch.

TABLE NO. 4. CONDUCTANCES OF VARIOUS THICKNESSES OF INSULATION

Material	Description	Density lbs. per cu. ft.	Mean Temp. °F.	Inches ½	¾	1	1½	1¾	2	3
Balsam Wool	Chemically treated wood fiber	2.2	90	0.54		0.27				
Cabots Quilt	Eel grass between Kraft paper	4.6	90	0.52		0.26				
Cabots Quilt	Eel grass between Kraft paper	3.4	90	0.50		0.25				
Celotex	Board form insulation made from sugar cane fiber	13.2	90	0.68		0.34	0.227	0.194	0.17	0.113
Corkboard	Pure; no added binder	14.0	90			0.34	0.227		0.17	0.113
Corkboard	Pure; no added binder	10.6	90			0.30	0.20		0.15	0.10
Corkboard	Pure; no added binder	7.0	90			0.27	0.18		0.135	0.09
Corkboard (Eureka)	Asphaltic binder	14.5	90			0.32	0.213		0.16	0.107
Dry Zero	Kapoc between burlap or paper	2.0	90			0.25				
Dry Zero	Kapoc between burlap or paper	1.0	90			0.24				
Fibrofelt	Flax and rye fiber	13.6	90	0.64	0.426	0.32				
Flaxlinum	Flax fiber	13.0	90	0.62		0.31				
Hairinsul	(75 per cent hair; 25 per cent jute)	6.3	90	0.54	0.36	0.27				
Hairinsul	(50 per cent hair; 50 per cent jute)	6.1	90	0.52	0.347	0.26				
Hairfelt	Felted cattle hair	13.0	90	0.52		0.26				
Hairfelt	Felted cattle hair	11.0	90	0.52		0.26				
Insulite	Board form insulation made from wood	16.9	90	0.68		0.34				
Linofelt	Flax fibers between paper	4.9	90	0.56		0.28				
Regranulated Cork	About 3/16 in. particles	8.1	90			0.31				
Rock Wool	Fibrous material, made from rock	10.0	90			0.27				
Sprayo-Flake	Shredded paper with silica binder	4.2	94	0.56	0.373	0.28	0.186		0.14	0.093
Thermofill	Dry, fluffy, flaked Gypsum	24.0	75			0.48				
Thermofill	Dry, fluffy, flaked Gypsum	18.0	75			0.34				
Red Top Wool	Spun Silica	1.5				0.26				
Zonolite	Exploded mica insulation	9.0				0.27				

Heat Conservation in Gas-Heated Buildings

tion losses which would, for most localities, be based on wind velocities of the order of 7 miles per hour. It is, therefore, evident that weatherstripping will reduce the maximum loss and the investment in heating plant to a greater degree than it can reduce the fuel consumption and cost for the whole season. It is, also, evident that for those rooms where windows are opened at night and for the time the windows are open, the fact that windows are weatherstripped can have no effect on fuel consumption. The same reasoning applies to double windows in so far as they are depended upon to decrease infiltration losses.

The figures used in our calculations have been taken from the data presented in the A.S.H.V.E. Guide. These figures show that for the typical structure that we are studying, the air changes due to infiltration with a 7-mile wind amount to considerably less than one change per hour. They, also, show that while weatherstripping will save 11.8 per cent of the total heat loss for the house for the maximum hour, and will consequently allow us to reduce our boiler and radiator sizes in this proportion, it will save less than 2 per cent of the fuel used per season.

The same figures, also show that if weatherstripping is planned when the house is built and the heating plant reduced accordingly, the saving in heating plant should

(Continued from Page 14)

pay for two-thirds per cent of the cost of weatherstripping, so that the return on the net investment is 14 per cent and decidedly worth while. In addition to this tangible saving in cost of fuel, weatherstripping will undoubtedly add very largely to the comfort of the occupants by preventing drafts and helping to maintain even temperatures in all parts of the rooms.

Double Windows and Storm Doors

Double windows and storm doors are not in general use throughout the country. It is only in those northern regions where zero and lower temperature are experienced each year that their use is general. There is no argument as to the very decided saving that they produce. Their more general use has undoubtedly been prevented by the difficulty and bother of putting them up for the winter, taking them down and storing them for the summer, and painting and keeping in repair. In our figures we have endeavored to make an allowance for the operating cost represented by these factors.

Our figures show that if storm doors and windows are planned when the house is built, we may save nearly 25 per cent of our heating plant capacity and 12 per cent of our fuel. This saving in plant capacity should more than pay for their cost if they are built with the building. We find a return of 22 per cent of our net cost and 18.5 per cent on the gross cost if they are installed after the house is built.

Insulation

We now approach what is probably considered by most heating authorities the most important of heat saving methods. The subject is a very broad one, for insulation is a term used to cover almost anything from one thickness of paper up to 6 inches of rock wool. In our discussions of the subject, we will confine ourselves to the more practical and usual applications met with in ordinary house construction. Our figures will again emphasize the fact that insulation is doubly valuable if its use is planned when the heating plant is figured so that it may not only save annual fuel cost, but it may pay for part of its own cost by reducing cost of the heating plant.

In the figures given as insulation in walls No. 1 and roof No. 1, we have assumed the material as a good grade of rock wool, placed in the walls and over the second floor ceiling 4 inches thick. We have assumed a cost of 12 cents per square foot if insulating is being done as the house is being built and of 16

Let's Make This A BUSY SUMMER

The market for Gas heating equipment naturally reaches a peak during the fall and winter months. But why wait? By taking part in the industry's Summer Gas Heat Campaign you can have additional business *now*, and also lay a foundation for a greater volume this fall.

This summer campaign is no experiment. For years it has helped heating dealers over the difficult off-peak season. This year we expect to hear, and for that matter, *are* hearing of especially good results. And it is not hard to understand.

For one thing, dealers are tying in with more *systematic* regularity and this, although not expensive, is the important part of the tie-in formula.

Second, our own promotional advertising to which these tie-ins are coupled has been greatly improved. The layouts and illustrations are more attention-getting; the copy more action-getting.

Study the copy in our current advertising. Notice how much more attractive the 10% Summer Discount looks when translated into estimated *cash* savings. Notice, too, how prominently the Deferred Payment Plan stands out. You will agree, at once, that these *buy-now* inducements have never been so forcefully presented.

Then, by using big, well illustrated advertisements, we make sure that *our* part of the Gas heat story gets wide reader-attention. And by designing our advertisements in a particular way, we make this reader-attention *shift* to your tie-in along side. Obviously this reduces the cost of your advertising by at least one-half, or to put it another way, it doubles the *effectiveness* of your advertising.

It is because of these things that we urge you to get into the campaign. By tying in, you make our readers *your* readers; our customers *your* prospects. It is the easiest way we know to make your advertising dollars do double duty . . . and to make this a busy summer.

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

Owned · Operated · Managed by Californians

NRA MEMBER U.S. WE DO OUR PART

The heater that smiles while it warms

FRASER

Radiant Front Console

Imagine a circulating heater with all the added advantages of a cheerful open fireplace. It is absolutely new—a revolutionary contribution to gas heating.

Manufactured by

Fraser Furnace Company

Stockton, California

Distributed by

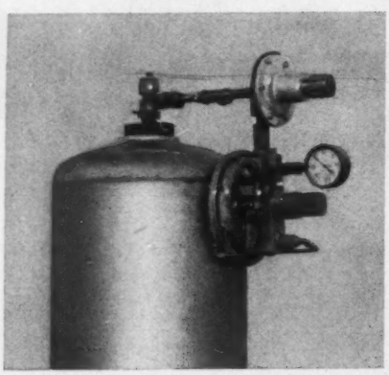
H. R. Basford Company

San Francisco Los Angeles

Announcing

"GASAIR"

Emergency-Repair Unit



Furnishing a Propane-Air mixture that makes burner adjustments unnecessary in change-over or emergency stand-by for either natural or manufactured gas service.

Operates on all makes of Bottled Gas.

Eliminates running a by-pass when work on service line is necessary.

The cost of a unit is less than the cost of running a by-pass.

UTILITY DEVELOPMENT COMPANY

5815 Third Street San Francisco, Calif.

cents if the insulation is blown in after the house is completed. We have used a conductance for the rock wool of .27 B.t.u.'s per square foot per degree difference for an inch thickness. Such insulation in our typical house gives us a saving on our maximum hour of 21 per cent for the walls and 10.6 per cent for the roof, with an annual fuel saving of 18.9 and 8.8 respectively of the total. The return on the investment, particularly if put in when the house is built, is very high. As a comparison, we show figures for the frequently used board insulation as plaster base.

In considering insulation, however, it is evident that there is some particular thickness that will give the most desirable results. We know that each additional inch of insulation saves less than the preceding inch. We will, certainly, come to some point beyond which it will not be wise to increase the thickness because of the law of diminishing returns. As soon as this point is reached, we will not obtain sufficient saving to pay for the additional investment. This point will, of course, vary with the cost of fuel, the efficiency of the fuel, and the degree days for the locality. In order to illustrate this condition and if possible to determine the economic thickness for a given set of conditions, we have prepared the figures shown in Table No. 3. These figures show the first cost of rock wool insulation from 1 to 6 inches thick, together with the total heat loss, the saving in heat loss and fuel and the return on the investment for the various thicknesses. It is assumed that the insulation is added to a wall or roof having a conductance of .27 B.t.u.'s per square foot per degree difference per hour.

These figures show a return on the gross cost of 33.6 per cent for the 1-inch thickness and of 14.5 per cent for 6-inch. If, however, we analyze this further, we find that the investment in the second inch of insulation returns us 19 per cent on its cost over a 1-inch thickness. The gross investment in the third inch yields us 9.5 per cent on its cost over 2 inches of thickness, while the investment in the fourth inch pays up only 5.5 per cent over 3 inches of thickness, and the saving of a 6-inch thickness over a 4-inch thickness will only yield 3.2 per cent return on the cost of the last two inches. We believe these figures are quite significant and that from them we might conclude that a 3-inch thickness of rock wool or its equivalent would be the most economical for the conditions we have assumed, since a return of 5.5 per cent which is all we get from the fourth inch, is not particularly attractive. If money is worth 6 per cent, the return on the fourth inch is less than zero.

It will be remembered, however, that in many cases the thickness of the insulation must be determined by other than purely economical considerations, as in many cases it is necessary to fill a given thickness or to spend more in confining it than the cost of filling the additional space. The savings of heat loss and fuel for various thicknesses of insulation for a locality having 4500 degree days and fuel at 10 cents per therm, are graphically illustrated by the curves of Fig. 1. In Fig. 2 the variation of interest return on investment is shown for a thickness of 4 inches of rock wool with varying costs of fuel and for different localities, varying from 3000 to 8000 degree days per season.

Table No. 4 gives useful data on a number of widely used insulating materials.

It must be realized that there are many factors to be considered in selecting the material for installation. The character of the house, construction, the facilities available for installation, the price of insulation at the time of installation—all must receive due attention. In dealing with the customer, we believe that it is important that he should not be allowed to expect too great a saving from insulation. The actual saving from properly installed insulation is enough to sell it. There has been, however, a tendency for some agencies selling insulation to promise more than they could perform. This has had a very bad effect.

We, also, wish to point out a very pernicious practice which should be combatted in every possible way, which is the custom of some builders to put in ½-inch thickness of board insulation and then in their selling talk to refer to the building as an insulated house. The layman who considers the purchase of the house does not inquire as to the thickness of insulation; he believes that he is purchasing an "insulated house," and is usually very much disappointed with the results as the thickness of insulation installed is inadequate to give an appreciable saving in his heating costs.

Whenever insulation is under consideration, we must not lose sight of the fact that in addition to keeping heat in in winter, it will keep heat out in summer, particularly roof insulation. Properly installed insulation, as we have shown, will pay a very attractive dividend in fuel saving. In addition, it will add very greatly to the summer comfort of the home. Either function, alone, will often justify its use.

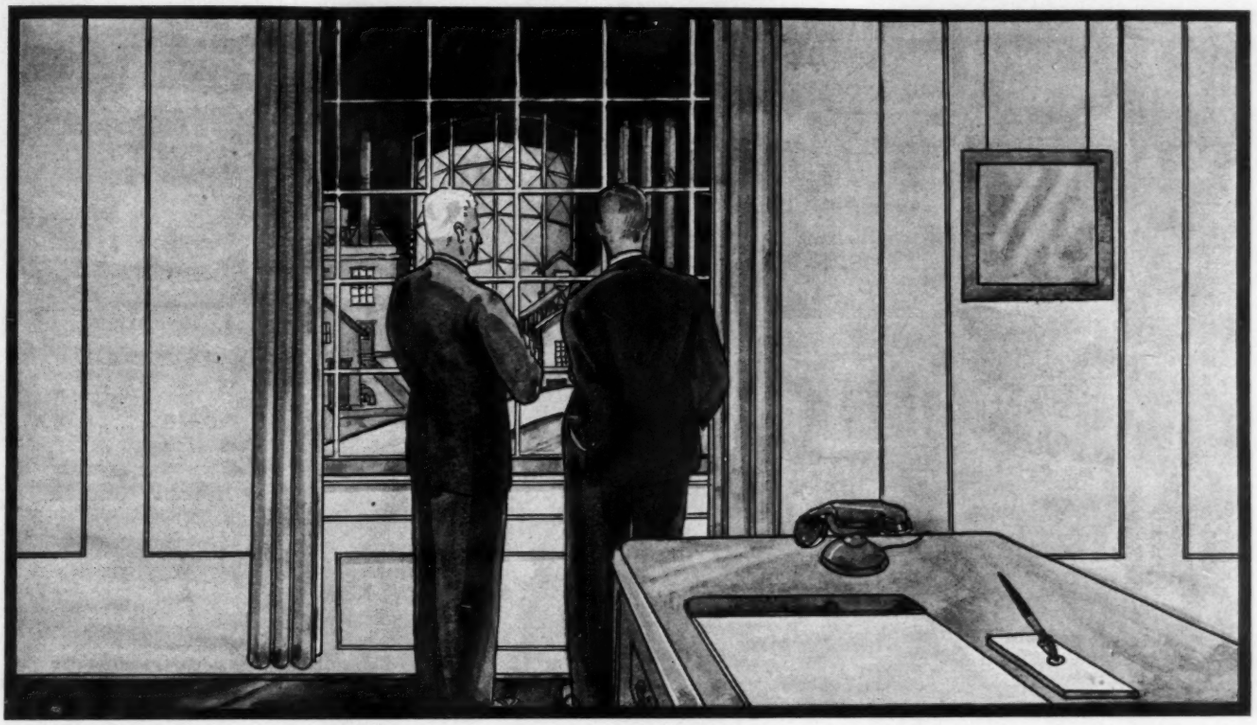
Minor Heat Conservation Measures

There are a number of heat losses from a building that are avoidable by care and foresight on the part of the occupants. Open fireplaces without dampers or with dampers left open when the fireplaces are not in use, can cause a heavy loss. Carelessness with regard to doors and windows may, also, account for considerable avoidable cost. Closing off rooms and cutting off radiators in rooms that are not in use, should be practiced. The weatherstripping of bedroom doors to keep the cold air in the bedrooms, when windows are open, out of the rest of the house may often be advisable if the doors do not fit tightly.

It should be the task of gas company representatives to educate gas users to think of these minor heat losses and take the necessary steps to eliminate them.

Conclusion

The whole object of this report has been to present in a simple, even elementary way some of the more important facts that have a direct bearing on the conservation of heat in gas heated buildings. We have endeavored to indicate what measures should be advocated and how far they can be carried with profit. There is, for every conservation measure, a point beyond which the additional expenditure fails to yield a worthwhile return. In weatherstripping we are limited by the need of a certain amount of air change to prevent sweating of windows and to pre-



"We Are in Command of A Situation where Formerly We Would Have Been Helpless"

—so a distributing company sum up their experience with the refractory screen oil gas process.

Continued heavy rains threatened to cut off the supply of natural gas. This company, however, had anticipated the possibility of pipeline failure, and *knew* they could continue serving their domestic customers.

Two things made this assurance possible:

1. **A plant in operating condition.**
2. **A gas that can 'double' for natural gas.**

Without these two requisites, stand-by generating equipment is useless.

Let us make a survey of *your* plant, and tell you how it can be made ready for really effective emergency use. Our own facilities and those of Combustion Utilities Corporation are available, without charge, for this service.

Write for complete information

IMPROVED EQUIPMENT-RUSSELL ENGINEERING CORPORATION
24 State Street **New York City**

serve a healthful condition in the air in the house. In insulation we have seen that beyond a certain and easily ascertained point, the return would not pay a satisfactory interest on the investment.

The heating engineer should not only recommend and specify the use of insulation and other heat conserving measures; he must definitely specify how and to what extent they are to be applied. It is only when this is done and done well that he is really serving those who depend upon him for advice.

Portland Conference Sounds Progress Note

(Continued from Page 24)

relations program may be more fully and more quickly realized.

Concluding this program centering around cooperation with dealers, A. F. Rice, sales manager, H. R. Basford Co., gave an excellent exposition of "The Dealers' Viewpoint" in his program on that subject.

Annual Northwest Dinner Concludes Conference

The final event of the Conference was the Annual Northwest Dinner, held at the Old Heathman Hotel. B. H. Parkinson officiated as toastmaster, introducing first the entertainers, who furnished vocal numbers and instrumental music. He then called for a number of brief responses, from J. A. Laing, H. M. Crawford, A. F. Rice, C. B. Babcock, A. E. Higgins, William Moeller, Jr., among others.

The speaker of the evening was then introduced, Frank Branch Riley, who impartially mixed humor with some practical advice to utilities; one well-timed observation was this: "Don't be too complacent, too matter-of-fact about this great industry you represent. You have let the electric industry take the spotlight long enough. Let the wonders of your own product be known."

Geo. L. Myers, assistant secretary of the Portland Gas and Coke Co., headed the efficient Arrangements Committee for the Northwest Conference, other members being C. R. Miller, Geo. F. Mackenzie, James N. Flood, and John Dierdorf.

Good Gain in National Gas Revenues for April

Reported revenues of manufactured and natural gas companies amounted to $62,287,300 for April, 1934, as compared with $59,597,000 in April, 1933, an increase of 4.5 per cent, American Gas Association totals.

Revenues of the manufactured gas industry aggregated $32,869,100 for the month, representing only a slight increase over the corresponding month a year ago. Revenues of the natural gas industry, however, totaled $29,418,200 for April or 8.9 per cent more than for April, 1933.

For the four months ending April 30th manufactured and natural gas revenues aggregated $269,843,300, an increase of 3.4 per cent over the first four months of 1933. Revenues from industrial and commercial users increased 15 per cent over the first four months of 1933, while revenues from domestic consumers were unchanged for the period.

Consumers Power Co. Purchases Michigan Utilities

CONSUMERS Power Co., subsidiary of the Commonwealth and Southern Corp., New York, N. Y., has purchased Michigan gas and electric properties of the Michigan Federated Utilities Co. and the Lower Peninsula Power Co., according to an announcement by D. E. Karn, vice-president and general manager of Consumers Power Co.

The Michigan Federated Utilities Co. properties include gas plants and distribution systems in Mt. Clemens, Plymouth, Owosso, Alma, Marshall, Alpena and Sault Ste. Marie. The Lower Peninsula Power Co. is an electric utility. It is proposed to operate the Alpena and Saulte Ste. Marie plants independently, but the other properties will be merged into the present system of the Michigan Federated Utilities Co. Gas distribution systems in Owosso, St. John and Ovid will be included in the at present all-electric Owosso division of the Consumers Power Co.

E. M. Ornitz i/c Pacific Coast Sales for Blaw-Knox

E. M. Ornitz, manager for many years of one of the important divisions of Blaw-Knox Co., Pittsburgh, Pa., has been transferred to the Pacific Coast to take charge of sales for the company through its Pacific Coast division, Blaw-Knox and Western Pipe Corp. The Pacific Coast branch maintains offices at 444 Market St., San Francisco, and at 5717 Santa Fe Avenue, Los Angeles, Calif.

Ruth Fuel Co. Purchases Natural Gas Utilities Co.

Ruth Fuel Co. has purchased the gas franchise of the Natural Gas Utilities Co., for distribution of natural gas in Collinsville, Okla. Rate schedule approved by the city of Collinsville follows: First 1 M cubic feet per month per consumer, 10 cents per 100 cubic feet; next 9 M cubic feet per month, 60 cents per M cubic feet; over 10 M cubic feet per month, 40 cents per M cubic feet.

Okla. Natural Opens Sub-Office

Oklahoma Natural Gas Co. has opened a sub-office at 132 West Commerce Avenue, Oklahoma City, in the Capitol Hill section, to facilitate business transactions with its 5,000 consumers residing south of the Canadian River. Thomas H. Sterling is district manager for the company at its office in metropolitan Oklahoma City.

Arnold E. Petersen Resigns

Arnold E. Petersen has resigned as sales manager of the Automatic Products Co. of Milwaukee, Wis., manufacturers of automatic control equipment.

The Goodman Stopper

The Reliable Shut-off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass..

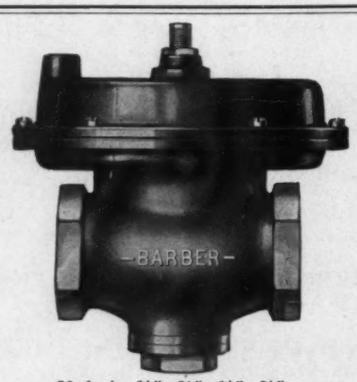
Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
135 Bluxome Street
San Francisco, California

NRA MEMBER U.S. WE DO OUR PART

SAVE
on gas bills!

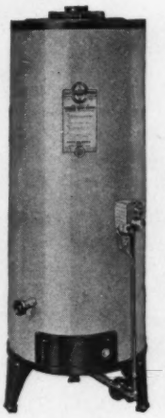
That's what every one of your customers is trying to do—get gas bills down as low as possible. With a BARBER Gas Pressure Regulator on any gas appliance, gas bills will be much lower. Show one to your customers, take the orders and the profit. Write for details.



Made in ¼", ⅜", ½", ¾", 1", 1¼", 1½", and 2" sizes

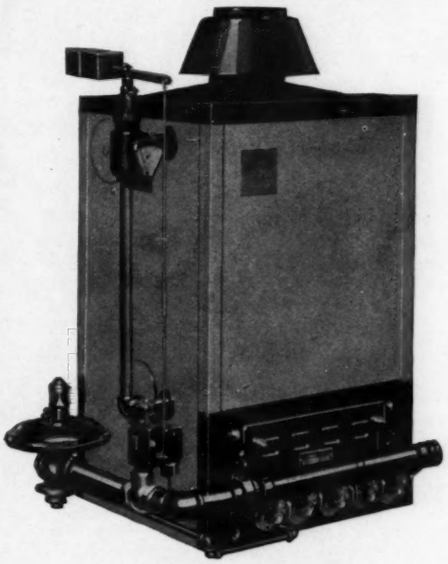
The Barber Gas Burner Co.
3702-4 Superior Avenue
CLEVELAND . . . . . OHIO

Dependable AGP Products



A. G. P. Gas Fired Automatic Storage Water Heater

Made in galvanized or Everdur tanks. 20-25-30-40-75 gallon sizes.



Ideal Gas Fired Boilers

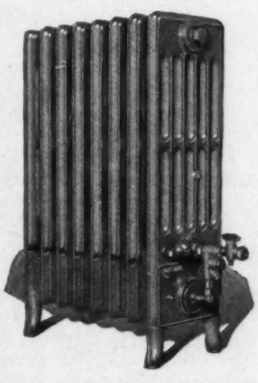
A. G. A. Steam Rating 270 to 16,000 Sq. Ft.
A. G. A. Water Rating 210 to 25,600 Sq. Ft.

The "Dictator" Low-Priced Water Heater

Made in galvanized or Everdur tanks.—15-20-30-40 gallon sizes.

A. G. P. Gas Fired Steam Radiators

Unvented in 26-32-38"heights. Ratings from 34 to 175 sq. ft. Vented made in 38" height only. Ratings from 28 to 99 sq. ft.

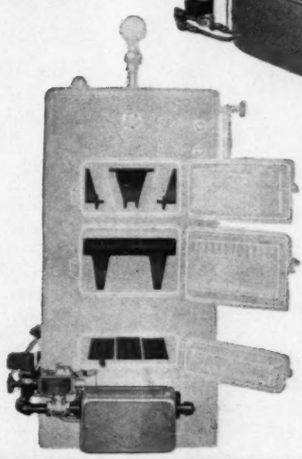


UNIT-OR Gas Fired Heater

Warm air convection type circulating heater. Enclosed in attractive cabinet finished in walnut or crystalline green enamel. The Unit-Or is so designed that it can be used either with or without a flue connection, with no material change or addition. Ratings from 70 to 110 sq. ft. equivalent C. I. Radiation.

Ideal Gas Convertor

Changes any type of furnace or round boiler into an efficient, automatic gas fired heating system. All controls are mechanical and centered in one valve. Fits all types of round boilers and furnaces. Special equipment makes it a "tailor-made" job for Arco Round Boilers, eliminating engineering on the job.



A. G. P. Redflash Gas Convertor

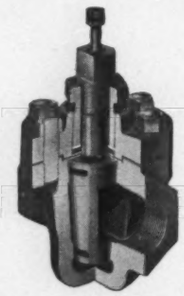
Especially designed only for all sizes No. 1 Ideal Redflash Boilers. Full automatic controls same as used on Ideal Gas-Fired Boilers, with or without room thermostat.

AMERICAN GAS PRODUCTS CORPORATION

40 WEST 40th STREET, NEW YORK, N. Y.

Division of AMERICAN RADIATOR COMPANY

NORDSTROM
Lubricated
PLUG VALVES



Cut-away view of Nordstrom Lubricated Plug Valve. Made in sizes from 1/2" to 30", in various metals. Also made with face-to-face dimensions same as gate valves, 2" to 12" permitting installation without altering pipe dimensions.

MERCO NORDSTROM VALVE CO.
A Subsidiary of
PITTSBURGH EQUITABLE METER CO.
Main Offices: Pittsburgh, Penna.
Branch Offices, Warehouses in Principal Cities

The reason for the long life and low maintenance cost of cast iron pipe is its effective resistance to rust. Cast iron is the one ferrous metal for water and gas mains, and for sewer construction, that will not disintegrate from rust. This characteristic makes cast iron pipe the most practicable for underground mains since rust will not destroy it.

For further information, write to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 Peoples Gas Bldg., Chicago, Ill.

CAST IRON PIPE

Look for this **Trademark**

Gas at the 1934 Chicago World's Fair

ON the *Western Gas* cover this month is a reproduction of "Smokeless City" which visitors to the 1934 Chicago World's Fair will recognize as a central panel prominently located in Gas Industry Hall. Located in the center of the south wall of Gas Industry Hall, this panel because of its height is the outstanding feature of the exhibit. Above the model of the Modern City is the figure of a workman and the figure of a housewife with the joining text "Gas—the Spirit of Heat—Ever Ready for Service in Home and Industry." Above these figures are the large letters "GAS" (not shown in front cover illustration) which appear in bright yellow letters against the red background.

This year's gas exhibit is a credit to the industry. Sponsored by the American Gas Association, the exhibit in its designing and assembling represents the work largely of the Peoples Gas Light & Coke Co.'s display department. It was designed by Harry Swenson, who is responsible for display work at "The Peoples Gas Building." It is the guiding purpose of the exhibit to tell the complete story of how modern gas appliances contribute to home comfort and convenience. To this end, the exhibit is designed to be "The most homelike spot at the Fair"; it avoids startling lighting effects, trick mechanisms and bizarre colors, the color scheme adopted being that of warm reds and browns and yellows. Gas appliances are shown in use in home sets.

Eighteen enormous murals, six of them tinted in lifelike color, depict intimate scenes of home life—a healthy baby filling his mouth with food—two children washing an unhappy dog—a man waking in the morning and reaching out an arm to set the thermostat on his heating plant.

The main exhibit occupies three walls of Gas Industry Hall, each approximately 100 feet long and 30 feet high. Separate sections of the exhibit are devoted to modern ranges, model kitchens, home heating appliances, model basements, gas-fired air conditioners, etc.

From a standpoint of the complete exposition of its theme, excellence of design and color harmony, the gas exhibit will be second to none. All of the gas appliances shown were furnished by the manufacturers. No appliances were shown in the industry exhibit at last year's fair.

Members of the committee of the American Gas Association, which sponsored the exhibit, also deserve congratulations for the enthusiasm and faith with which they have pushed plans for the Gas Industry Exhibit. They are: R. B. Harper, chairman, The Peoples Gas Light and Coke Co., Chicago; C. N. Chubb, American Light and Traction Co., Chicago; J. D. Creveling, Henry L. Doherty and Co., New York; B. J. Mullaney, The Peoples Gas Light and Coke Co., Chicago; Henry O. Loebell, Natural Gas Pipeline Co. of America, Chicago; T. V. Purcell, The Peoples Gas Light and Coke Co., Chicago; N. T. Sellman, Consolidated Gas Co. of New York, and C. W. Berghorn, secretary, New York.

MODERN METHODS AND MATERIALS

A letter to WESTERN GAS will bring you any of the selected reference bulletins listed below, without cost. Indicate by number which you desire.

NO. 12—VENTURI TYPE BURNERS

Description of full burner line using Venturi principle; capacities and dimensions of all types.

NO. 13—REFRACTORY CONCRETE

Method of casting refractories on the job, described in 8-page bulletin, illustrated.

NO. 14—TESTS FOR WELDERS

Outline of simple tests for measuring ability of welders, including fracture tests, bend tests, tensile tests, observation test. Summary of qualification tests for welding steel plate and pipe. 24 pages, 25 illustrations.

NO. 15—GAS VENT AND FLUE PIPE

New type product described; construction specifications, price list, illustrations. Four pages.

NO. 16—FLANGED VALVES

Line of valves interchangeable with standard gate valves in face-to-face length; full specification data. 12 pages; 17 illustrations.

NO. 17—REGULATORS AND GOVERNORS

Catalog on complete line, service and high pressure regulators, district regulators, low pressure and holder governors, industrial regulators, liquefied gas regulators, relief valves for water, air and oil; pipe end reamers. Specifications, capacity data. 48 pages, 40 illustrations.

NO. 18—BUTANE-PROPANE PUMPS

Three circulars describing steam-driven close clearance type pumps, and small power pumps for handling propane and butane.

NO. 19—AIR CONDITIONING

Forced air furnace and air conditioning equipment. Construction and capacity details, cutaway illustrations, formulae for estimating gas costs, degree day data, size of warm air pipes, furnace efficiencies. Description of line of floor and space heaters and conversion burners, with specification data. 52 pages; many illustrations.

NO. 20—BUTANE CARBURETOR

Nature of commercial liquefied petroleum gases; pertinent facts bearing on use as fuel in engines for trucks, tractors, pumps, etc. Line of carburetor equipment, and accessories, fully described with diagrams of suggested hook-ups. Information on butane regulations, tanks, fittings, hoses, etc. Mimeographed; 28 pages; 7 diagrams.

NO. 21—GAS ANALYSIS MANUAL

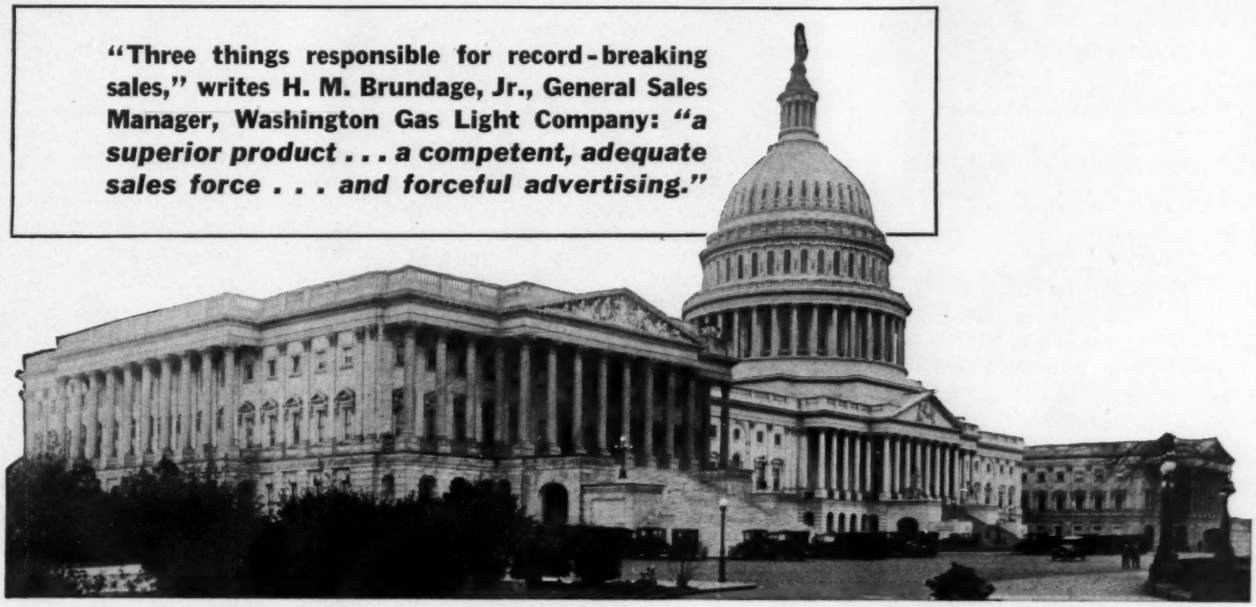
Manual for use with Orsat type apparatus; sections on analytical methods for various gases, assembling apparatus, procedure; data on composition of gases. Commercial line of gas analysis apparatus described and illustrated. 64 pages.

WASHINGTON'S

REFRIGERATION SALES FOR MAY

GREATEST IN HISTORY

"Three things responsible for record-breaking sales," writes H. M. Brundage, Jr., General Sales Manager, Washington Gas Light Company: *"a superior product . . . a competent, adequate sales force . . . and forceful advertising."*



DURING the month of May, gas refrigeration sales in Washington *more than doubled* sales during the same month in 1933!

Behind this highly gratifying performance—gratifying not only to the Washington Gas Light Company but to the entire gas industry as well—stands a record of seven years' aggressive merchandising of gas refrigeration in the face of active and outnumbering competition.

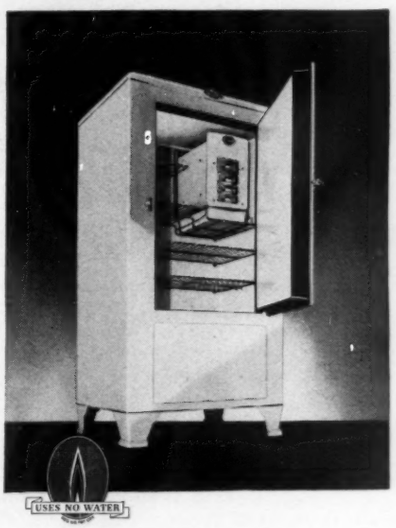
Planned Sales Effort

Thanks to the triple resources of intelligent planning, a well-trained sales force, and effective local newspaper advertising, each year saw a steady increase in gas refrigeration sales as more and more Washington families became acquainted with the vital facts of Electrolux's unmatched advantages.

Today, the opportunities which Electrolux offers to the gas companies of America are greater than ever. The 1934 Air-Cooled Electrolux is unquestionably the finest refrigerator made. In addition to the famous unit, which makes possible its greater economy and permanent silence, Electrolux embodies all those worthwhile conveniences women demand.

Summer Opportunity

With the hot summer weather just beginning, the time is ripe for your company—as for every gas company—to take advantage of Electrolux in insuring that the refrigerators installed in your community are *gas* refrigerators. For assistance in forming your summer sales and merchandising plans, write, wire or phone Electrolux Refrigerator Sales, Inc., Evansville, Ind.



NEW *Air-Cooled*
ELECTROLUX
THE SERVEL *Gas* REFRIGERATOR

Electrogas

- Floor Furnaces
- Junior Basement Furnaces
- Senior Basement Furnaces
- Pipeless Furnaces
- "Streamline" Built-in Furnace Filter Units
- Air Washers and Blowers
- Electrogas Quick Safety Pilot

Electrogas

ELECTROGAS FURNACE & MFG. CO.
2575 Bayshore Blvd., *San Francisco*
164 South Central Ave., *Los Angeles*

Gas Is Cheaper . . . We Can Prove It!

(Continued from Page 11)

Draw-offs were made from both types of storage water heaters at regular intervals and in amounts corresponding to average uses of hot water in homes. As in the cooking tests, an attempt was made to represent actual residence service requirements insofar as possible.

The water heating tests proved that for storage water heating 1 unit of gas (20 cu.ft. 500 B.t.u. gas) equals 2.04 kw. hrs. These ratios correspond closely to findings made by the A.G.A. Laboratory and other authorities.

It was not enough to establish the ratio between gas and electricity for cooking and storage water heating. The next important step was to determine the average consumption of both fuels in the home and show the relative costs for this service. As to average consumption of electricity for cooking and storage water heating we learned from one of our friends in the electrical business that an analysis of 16,000 customers showed an average use of 580 kw. hrs. per month, of which 387 kw. hrs. represented storage water heating as metered separately. After some investigation it was found that homes of this type used approximately 45 kw. hrs. for lighting and small appliances, leaving a balance of 148 kw. hrs. per month for cooking.

Applying the above ratios of gas to electricity it was determined that if the same people used gas for cooking and storage water heating:

148 kw. hrs. at 1.4 kw. hrs. per gas unit ..... = 106 units
387 kw. hrs. at 2.04 kw. hrs. per gas unit ..... = 190 units

Total gas consumption = 296 units

With this information in hand the comparative cost at Seattle rates was easily computed. The local domestic electric rate is as follows:

First	40 kw. hrs. at	5½ cents
Next	200 kw. hrs. at	2 cents
All over	240 kw. hrs. at	1 cent

Off-peak storage water heating rate with clock control shutting off service from 3:30 to 7:30 P.M. at 0.8 cents per kw. hr.

The Seattle therm rate for gas storage water heating and other domestic service is as follows:

Customer charge $1.00
First 200 units at 1.5 cent
Next 300 units at 1.1 cent
All over 500 units at 1 cent

Comparative Cost at Seattle Rates:

Electricity

148 kw. hrs at 2c $2.96
387 kw. hrs. at 0.8c 3.10

Total Electricity (535 kw. hrs.) $6.06

Gas

Customer charge $1.00
200 units at 1.5c 3.00
96 units at 1.1c 1.06

Total Gas $5.06
3% City Tax ..... .15

Total $5.21

Saving in gas over electricity ..... $ .85
Percentage of saving in gas over electricity 14%

Note: New electric rate in Seattle alters above figures as follows: first 195 kw. hr. at 2 cents equals $3.90; remaining 340 kw. hr. at 0.75 cents equals $2.55 or a total of $6.45 instead of $6.06 for electric costs. This represents 19 per cent saving of gas over electricity instead of 14 per cent.

Approaching the problem of average consumption from the standpoint of our own experience with gas consumers, a careful analysis was made of 100 customers using gas cooking and storage water heating. It was found that these customers used an average of 6400 cu.ft. or 320 units per month, of which approximately 2600 cu.ft. or 130 units represented gas cooking and 3800 cu.ft. or 190 units gas water heating. Assuming 60 kw. hrs. for lighting and small appliances and converting the gas consumption to the equivalent electrical energy, the following corresponding amounts of gas and electricity would be required to do the same work.

Johnson Melting Furnaces

Fast—efficient—dependable

The Johnson line of melting furnaces includes a wide range of sizes. The unit shown is the No. 15, which will heat a capacity of 18 pounds of lead in less than 10 minutes. Numerous other models are available, with capacities up to 600 pounds of lead. Write for complete catalog and price list.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. BABCOCK CO.
135 Bluxome St., San Francisco, Calif.

GENERAL CERAMICS COMPANY
• REFRACTORIES •

Refractories for conversion burners, space heaters, and circulating heaters. Made to exacting standards of quality—standards which are maintained by modern production methods, careful workmanship, and accurately controlled burning. Our engineers will gladly cooperate on new designs, alterations, production economies, etc.

General Ceramics Company, 71 West 35th Street, New York

	Kw. hrs.
Electricity used for lighting, etc.	60
Gas Cooking 2600 cu.ft. or 130 units at 1.4 kw. hrs. per unit	182
Gas water heating 3800 cu.ft. or 190 units at 2.04 kw. hrs. per unit	387
Total 6400 cu.ft. or 320 units	569

Comparative Cost at Seattle Rates:

Electricity	
180 kw. hrs. at 2c	$3.60
2 kw. hrs. at 1c	.02
387 kw. hrs at 0.8c	3.10
Total Electricity	$6.72
Gas	
Customer charge	$1.00
200 units at 1.5c	3.00
120 units at 1.1c	1.32
Total Gas	$5.32
3% City Tax	.16
Total	$5.48
Saving in gas over electricity	$1.24
Percentage of saving in gas over electricity	18.4%

(*Note:* New electric rates referred to before reduced this saving to $1.04, or 15.9 per cent.)

It is significant that the above savings of gas over electricity are dependent upon a combination rate for storage water heating and cooking service. It is true that the average customer using gas for cooking alone at the higher rate makes very little, if any, saving over electricity. However, using combined cooking and storage water heating service at the lower rates insures a monthly saving equal to the above examples or larger where more cooking and storage water heating are involved. It all points to the desirability and advantages of sponsoring all-gas-equipped homes. It is obviously uneconomical if not extravagant to divide the domestic service between gas and electricity excepting for lighting.

Building Sales Campaign on "Gas Is Cheaper"

Having definitely established proof that gas is at least 14 per cent cheaper than electricity for cooking and storage water heating, the golden opportunity presents itself for capitalizing on the above slogan and building sales campaigns on the economy of gas service. The Seattle Gas Co. is at present using seven deluxe bulletin boards carrying the above message, in addition to copy on gas bill envelopes, newspaper advertising, cooking school demonstrations, window and floor displays. Even automobile tire covers carry the message that "Gas is 14 per cent Cheaper Than the Nearest Competitive Fuel for Cooking and Storage Water Heating."

This same convincing information has been stressed in sales educational meetings and printed information in detail has been given to all employees who rank as Business Builders of the company. The more publicity given this proof, the more enthusiastic do the salesmen and employees become in their efforts to sell gas service and appliances.

To definitely tie-up with this 14 per cent saving slogan, a combination appliance offer campaign is now in progress. A 17-gallon storage water heater and medium sized gas range, which sell regularly as separate units for $138.50 including the old trade-in appliances, are being offered during the special campaign at $98.50 (including the old water heater and stove) or a combination offer saving of $40.

Longer than usual terms are available to customers who could not otherwise take advantage of this offer in purchasing the two appliances at one and the same time. It is intended that larger and better appliances be substituted for the units in the low priced offer according to the customer's requirements and pocketbook.

This campaign provides that a customer may make a double saving in one purchase; first, 14 per cent or greater saving in operating cost with gas over the nearest competitive fuel, and second, $40 saving in purchase price at extremely easy terms—so low that almost any customer can conveniently finance the purchase of both appliances. In many cases the saving in operating cost alone will materially help to pay the monthly installments.

It has been definitely proved that gas is 14 per cent cheaper than the nearest competitive fuel for cooking and storage water heating. Business Builders and salesmen have "proof cards" in their possession for easy reference.

No one has challenged the figures. At last, the gas man has come out from under cover and challenged his opponents to an open combat. "To the victor belongs the spoils." Let's go and reap a harvest that rightfully belongs to gas service!

with **N. G. E.**

Venturi type burners a constant air-gas ratio.

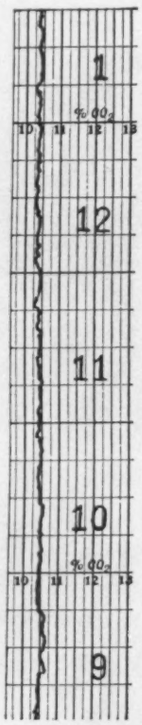
The improved Venturi type 10-B and 11-B operate on the principle of entraining the larger part of the air required for combustion by the pressure energy of the gas issuing from an orifice into the Venturi throat of the burner. N. G. E. burners utilize the Venturi principle to inspirate and mix the air with the gas and they maintain an accurate and constant air and gas ratio over a wide range of pressures. Their modified design however, provides in addition, excellent flame retention qualities and low turndown characteristics that adapt these burners to a wide range of requirements. Because N. G. E. Venturi type burners operate under minimum draft requirements, the severe drumming and vibration frequently encountered in burners depending on stack draft is entirely eliminated.

Write for copy of new bulletin on N. G. E. Venturi type burners

NATURAL GAS EQUIPMENT INC.

Petroleum Securities Bldg., Los Angeles | **1123 Harrison Street, San Francisco** | ***Arizona Distributor:* Crane Co.**

LOOK TO THE PIONEERS FOR CONTINUED LEADERSHIP



ASK FOR BULLETIN 320-W

Save your preventable stack losses!

Complete burning of the fuel with minimum excess air is the first essential of efficient and economical furnace operation. The DFC Automatic Combustion Control makes this an accomplished fact. It holds CO_2 at highest point (see chart) and excess air at lowest. Steam pressures maintained within 2% plus or minus regardless of demand fluctuations.

Loads varied constantly during run charted —from 65% to 150% of rating.

Investigate the new, amply proved - - - - -

DFC AUTOMATIC COMBUSTION CONTROL

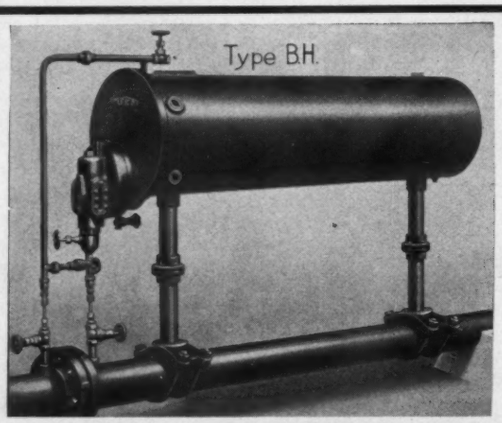
THE DENVER FIRE CLAY COMPANY
DENVER DFC COLO. U.S.A.
BRANCHES AT SALT LAKE CITY. EL PASO. AND NEW YORK

PAPICO
ODORIZER Features

- Continuous, automatic operation.
- Odorant waste prevented.
- Lowest operating cost.
- Odorant injection substantially proportional to gas flow.

Bulletin No. 05 gives full details.

HARRY F. HALDEMAN, Inc.
Engineered Products
411 W. Fifth St., Los Angeles, Calif.

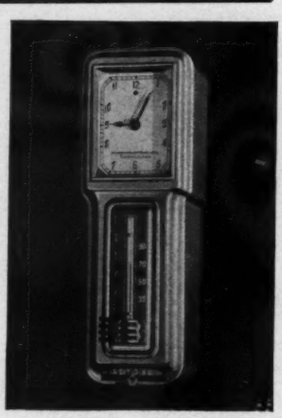


SATISFIED CUSTOMERS

■ Keep your customers satisfied by recommending and installing the Chronotherm*... the greatest achievement in the field of automatic heating. It provides unvarying temperatures and will entirely eliminate "Cold 70°", and save fuel by doing so. Minneapolis-Honeywell Regulator Co., 401 East 28th Street, Minneapolis, Minn.

■

MINNEAPOLIS-HONEYWELL
Control Systems



The Chronotherm*... Provides absolute unvarying temperatures and eliminates "Cold 70°".
* *Formerly called Thermochron.*

Gas vs. Electricity In Cooking Tests

Advantages in using gas for cooking in comparison with electricity have been brought out in a series of tests carried on under the direction of Mrs. D. D. Cottington Taylor by the Good Housekeeping Institute.

Tests were conducted on three pairs of gas and electric cookers, preparing similar menus over a period of seven days.

It was found that breakfast could be prepared about 30 per cent faster with gas than with electricity, and water boiling was on the average 63 per cent more rapid on the gas cooker. The report indicated that the quality of cooking was practically identical with gas and electric cookers.

The tests showed about a 7 per cent advantage in favor of gas, in comparing the operation of taps and switches on the gas and electric cookers, because of the ease of adjustment of gas taps in controlling the heat.

Comparisons further indicated that in an electric oven the heat is not immediately available, and requires more judgment in its operation; the three position electrical switch is not as flexible as a gas tap; simmering is difficult on an electric cooker; and the thermostat simplifies oven cooking with gas.

United Gas Public Service Company Erecting $400,000 Booster Station

The United Gas Public Service Co., Houston, Texas, has begun construction of its Iowa oil field booster station near Woodlawn, La., at an estimated cost of $400,000. Two major buildings of steel construction will house 10 large compressors developing 1,700 horsepower.

The booster station will have a capacity of 11,000,000 cubic feet daily. Gas will be brought to the station through an 8-mile pipe line which United will build from the Shell Petroleum Corp.'s natural gasoline plant also under construction. The United Gas Company's booster station will receive the gas at a pressure of 40 pounds and increase it to 400 pounds for entry into the company's main pipe line from Texas which serves southwestern Louisiana communities.

Clarendon, Texas, Endorses Tentative Franchise

Smith Brothers Co., McLean, Texas, has been granted a tentative franchise to serve Clarendon, Texas, with natural gas. Supply would come from the company's field near McLean. A 45 cent per M c.f. rate would be offered to domestic consumers, 22½ cents for industrial purposes, and 12½ cents to schools, churches, and similar consumers.

Lewis Air Conditioners, Inc., Grants Licenses

Lewis Air Conditioners, Minneapolis, Minn., has licensed Julien P. Friez and Sons, Inc., Baltimore, Md., and the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., under Patent No. 1,785,741, entitled "Air Conditioning Systems." The Detroit Lubricator Co., Detroit, Mich., was recently licensed under the same patent.

L. A. County Fair Goers Will Learn About Gas

Another comprehensive gas exhibit is being planned by the Natural Gas Bureau for the Los Angeles County Fair, to be held in July at Pomona, Calif. The Bureau represents the Los Angeles Gas and Electric Corp., Southern California Gas Co., and Southern Counties Gas Co. A large island display will be created in the main Fair building featuring domestic appliances, and Southern California manufacturers and distributors of appliances will conduct exhibits in this section. In the machinery tent will be another large gas engine exhibit, arranged by the Bureau and participated in by manufacturers of many makes of gas engines. A similar exhibit last year created unusual interest.

Clyde H. Potter, commercial manager of Southern Counties Gas Co., is chairman of the Natural Gas Bureau, his term ending on July 1, when W. M. Jacobs, new business manager, Southern California Gas Co., will succeed to the office.

So. Calif. Gas Educational Course Extended to Water Heating

Southern California Gas Co.'s employee educational program, which has already covered ranges and refrigerators, is being extended to cover water heating, according to Lee Holtz, chairman of the company's educational committee. The curriculum has been laid out to eventually include every gas appliance, the company's educational course being one of the most comprehensive in the industry.

Important Change In Laboratory Approval Policy

AN important change in policy governing the extension of American Gas Association Laboratory approval has been approved by the Association's Executive Board and will become effective January 1, 1935. It requires that:

1. The final copies of approval requirements shall be distributed to the gas industry at least nine months in advance of the date on which they are to become effective.

2. Hereafter, all new and revised requirements adopted shall be made effective on January 1.

3. Approvals and/or listings granted, following compliance with applicable approval and/or listing requirements as determined by the A.G.A. Testing Laboratory, shall be effective for a period not to exceed five years, subject to satisfactory annual inspections and compliance with other conditions specified in the existing form of the Laboratory Application for Test.

4. At the time of the annual inspection after the expiration of such five-year period, appliances and/or accessories must comply with the applicable approval and/or listing requirements in effect as of January 1 of the year in which the period of approval and/or listing expires in order for approval and/or listing to be continued. Upon compliance with such requirements at the end of the five-year period, approval and/or listing shall be extended for another five-year period, subject to annual inspections and other conditions prescribed in the Laboratory Application for Test.

5. All appliances approved before January 1, 1931, must, on or before January 1, 1936, comply with the applicable requirements in effect on January 1, 1935.

6. All appliances approved during the calendar year 1931 must comply on or before January 1, 1937, with the applicable requirements in effect January 1, 1936. This same procedure shall be followed in increments of five years each for all appliances approved and/or accessories listed during succeeding calendar years.

Service-Survey Campaign in Two So. Counties Towns

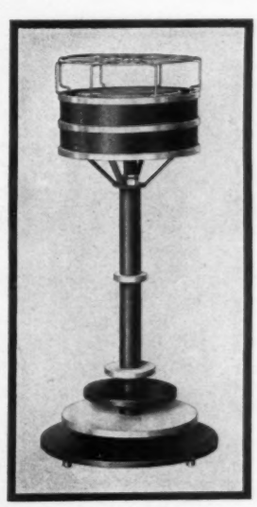
Two special service-survey sales campaigns on water heaters are being conducted by Southern Counties Gas Co., one in Uplands, and the other in Oxnard, Calif. Special house-to-house workers are reporting on types of equipment, gas and competitive fuels, in use for water heating, and it is expected that the findings will have a bearing on future campaigns in this field.

New Type Blodgett Gas Oven

G. S. Blodgett Co., Inc., Burlington, Vt., has published a circular describing a new type Blodgett gas oven, No. RB-15, and will supply copies to those desiring them.

A NEW *Payne* PRODUCT...
MODERNE PEDESTAL *Gas* HEATERS

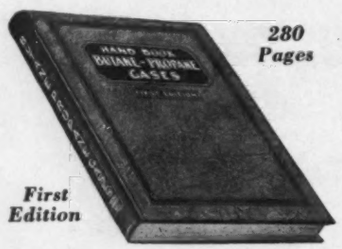
■ MODERNE PEDESTAL HEATERS are made in three sizes to meet all needs for portable gas heaters. Finished in satin black and dull chrome, they are dust proof and tarnish proof. No elements to break and no difficult adjustments to make. Backed by a firm with eighteen years experience in the manufacture of gas heating equipment. Every New Business executive will recognize its sales possibilities and will welcome the addition of the Payne Moderne Pedestal Heater to their line of gas heating appliances. *Write for descriptive literature today!*



PAYNE FURNACE & SUPPLY COMPANY
BEVERLY HILLS, CALIFORNIA

A COMPLETE REFERENCE ON

BUTANE-PROPANE GASES



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ORDER NOW

Send $5.00 to WESTERN GAS, 810 South Spring St., Los Angeles, Calif.

Appliance Society Range Drive Again Scores Success

By JEAN SCOTT FRICKELTON
Gas Appliance Society of California

WITH the slogan "Stop Cooking in the Horseless Carriage Age" the Gas Appliance Society of California scored another of its customary triumphs in its annual Spring Gas Range Campaign.

The final report shows that in the territory covered by the Pacific Gas and Electric Co. alone 3,244 gas ranges were sold during the month of April. This represents a substantial increase over the sales for April of last year, when only 1,528 ranges were sold, and over May, 1933 (the month in which Gas Range Week was held last year) which had sales totalling 2,586 gas ranges.

Approved at an early date by the Society's Board of Directors, and guided by B. W. Reynolds, Promotional Director for the Society, the campaign plans took form in practical sales stimulating features, all aimed toward helping the dealer sell more and better gas ranges.

The campaign divided itself into three distinct parts:

First, a general promotional plan for the entire month of April.

Second, an intensive selling effort with a special inducement for one week only (April 14-21).

Third, the supporting program of the Pacific Gas and Electric Co.

The general promotional campaign was featured by a billboard showing, which included 275 poster-boards in cities and towns, and along the highways, from Eureka in the North to Bakersfield in the South, including the territory served by both the Pacific Gas and Electric and the San Joaquin Light and Power Corp.

In addition, dealers were given eight-color cards in two sizes, carrying the same copy theme as the billboard, for their floor and window displays.

Since the month's activities were financed by the Society's "sticker plan," these cards were provided only for dealers selling ranges made by manufacturers and distributors cooperating in this plan.

The special offer for Gas Range Week was the giving away of a $16 oven heat regulator on every kitchen heater type gas range regularly selling at $125 or more (net $109), and with every straight type gas range regularly selling at $96 or more (net $80). The cost of the thermostat was divided between the dealer and the manufacturer.

Display cards featuring the special offer during Gas Range Week were prepared by the Society, and some 1,500 of these were distributed through the territory.

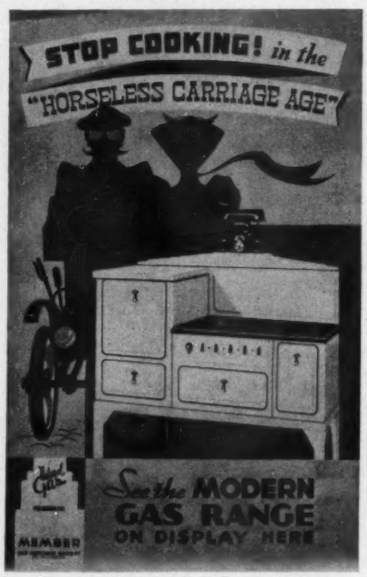
The San Francisco Unit of the Gas Appliance Society used some 200 of these cards for street car dash boards, carrying the message "This week only—You can save $16 on Gas Ranges."

Radio announcements telling the public of the special offer of a free oven regulator were broadcast at intervals during the week over stations KYA and KJBS, San Francisco; KLX and KROW, Oakland; KFBK, Sacramento; KWG, Stockton; KMJ, Fresno; and KQW, San Jose.

The Society edited a newspaper clip sheet, containing suitable publicity, editorial and picture material for the use of newspapers in getting out special pages or sections of dealer tie-in advertising during the campaign.

Free mat service for both dealers and newspapers was included in the publicity program.

The dealers' enthusiasm was stimulated through a series of unit meetings held throughout the territory at which details of the campaign were announced, and opportunities pictured by leaders within the industry. Dealers were further familiarized with all the campaign details through a series of bulletins and a broadside entitled "What's Doing in April."



Dealer display card for April range campaign of Gas Appliance Society of California.

The Pacific Gas and Electric Co.'s supporting program included advertisements in 291 daily and weekly papers throughout Northern and Central California. The first ad, which ran a week prior to Gas Range Week, was built around the old style stove as compared with the modern gas range. The second ad, which ran during Gas Range Week, tied-in with the Society's special offer. Both ads directed the public to the dealer store and gave the dealers a key-piece for tie-in advertising in special newspaper pages or sections in various newspapers.

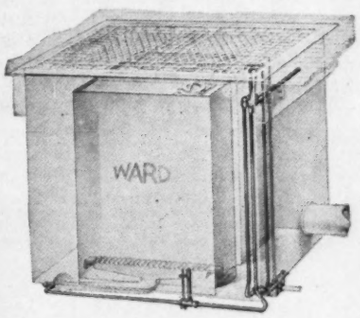
The Pacific Gas & Electric Co. also devoted its April bill sticker, attached to approximately 500,000 gas bills, to the gas range campaign theme, and gave over windows and floors in many of its offices to cooperative displays of gas ranges.

Reports from individual member dealers

BILT-IN Thermo-Control

—was adopted as standard equipment on Ward Floor Furnaces less than a year ago, and became an immediate success. The buying public, appreciating its simplicity, ease of manipulation, and economy, responded handsomely. As a result, 85% of the Ward Floor Furnaces sold have been equipped with the

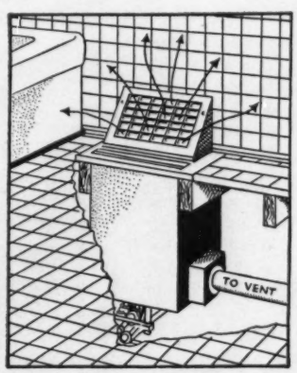
BILT-IN THERMO-CONTROL



Since then **Thermo - Control** has been improved. Gas friction has been reduced, a new indicator dial is used, and a few other little things have been touched up. Nothing important—no radical changes were necessary — but all in line with Ward's policy of constantly striving for perfection.

AND THE WALL-HE-TOR

—which is Ward's latest creation, now gives the gas industry entree to America's bathrooms with a **vented** appliance that is safe and occupies little space . And its operating cost is about one-fifth that of electricity. Wall-He-Tor also solves the problem of economical gas heat for small bedrooms, dens, and breakfast rooms.



Write for information as to how utilities and dealers are featuring these items in their special summer sales

AMERICAN GAS ASSOCIATION · APPROVED · COMPLIES WITH NATIONAL SAFETY REQUIREMENTS

WARD
Heater Company
1800 W. WASHINGTON BLVD.
LOS ANGELES, CAL.

"MODERNIZE as you repair"

THE SPRAGUE METER COMPANY

BRIDGEPORT, CONN.

Los Angeles, Calif. San Francisco, Calif.

Davenport, Iowa.

Newark, Ohio. Houston, Texas.

NEW *Sales Literature*

Now Available!

Pacific
GAS HEATING HEADQUARTERS

Our Line for 1934!

- FLOOR FURNACES
- CABINET HEATERS
- WALL HEATERS
- GAS STEAM RADIATORS
- RADIANT HEATERS
- WATER HEATERS
- GRAVITY FURNACES
- FORCED AIR FURNACES
- UNIT HEATERS

The Outstanding Gas Appliance Line of the Pacific Coast. Write for complete information on any or all items . . .

Pacific Gas Radiator Co.
Main Office and Factory
Huntington Park, California
Oldest and Largest Manufacturer of Gas Heating Appliances in the West

demonstrate that this year's Gas Range Week campaign was one of the Society's most successful efforts, both from a standpoint of volume sales and unit prices. At the conclusion of the campaign letters poured in from leading retailers throughout the territory reporting sales achievements, and the following comments from several San Francisco dealers are typical:

Sterling Furniture Co. range sales increased 12 per cent over last year, averaging $132 per range.

Charles Brown & Sons were 33-1/3 per cent above last year, sales averaging $100 per range, after deducting the $16 allowance.

Nathan Dohrmann Co. last year set a record of $133.80 for unit price during Gas Range Week, but this year exceeded the previous market mark with $141.75 per range.

Spark Stove Shops gained 100 per cent in volume, 125 per cent in dollar value over 1933.

J. H. Wiley Co. exceeded last year by 64 per cent, selling virtually all deluxe models.

John Breuner Co. doubled its 1933 sales. Last year the company's unit price was $103.09, this year $140.81.

Berkeley-Stanford Sessions on Fluid Mechanics

JUNE 19 to 21 at the University of California and at Stanford University the Aeronautic and Hydraulic Divisions of the American Society of Mechanical Engineers gave special study to problems of fluid mechanics. Among others, the Pacific Coast Gas Association was represented at the meeting by Frank Wills, of the Pacific Gas and Electric Co., who read a paper entitled "The Friction Factor for the Stanpac Natural Gas Transmission Line." This was presented at the session held on the campus of Stanford University, at which time there were also under discussion phenomena of the "Mixing of Fluid Streams" and "A Survey of Flow Calculations Methods." An interesting result of comparison of the several papers was the discovery that the friction factor for long pipe lines used for gas and oil show close agreement.

One of the features of the meeting was the devotion of an entire day to the study of problems of fluid mechanics common to aeronautics and hydraulics. Papers of special interest to those in the gas industry include one on the "Special Characteristics of Mud-Fluid Flow" by A. J. Carlson, University of California, and another on "Physical and Thermal Properties of Hydrocarbons" by B. S. Sage of the California Institute of Technology. The preprints of these papers were available at the meeting and can be had at cost by addressing the Secretary of the San Francisco Section of the A.S.M.E.

A feature of the meetings was the widespread cooperation of Pacific Coast universities and engineers generally in the program. Attendance was excellent. At the technical sessions from 100 to 150 were present at combined sessions and from 40 to 85 at separate sessions.

Western Gas is indebted to B. M. Woods, chairman, Department of Mechanical Engineering, University of California, for the above report.—*Editor.*

POSITIVE ECONOMICAL PROTECTION

Because of its great economy you cannot afford not to use NO-OX-ID. Absolutely stops pitting and corrosion and prevents future deterioration. PROTECTION SUPREME for steel including gas holders, auxiliary equipment and pipe lines. Serviced by men who are experienced in the problems of the gas industry.

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San Francisco: 421 Bryant St., Phone SUtter 8688

NO-OX-ID
IRON RUST
The Original Rust Preventive

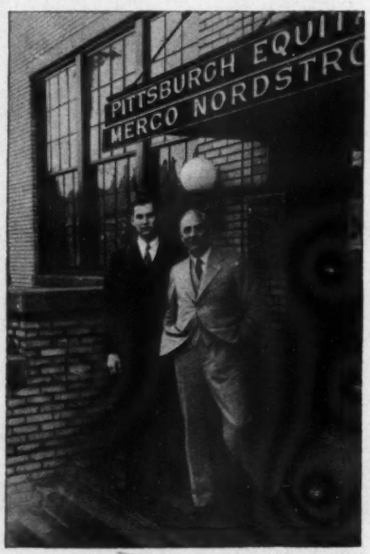
Booklet on Oxwelding Corrosion-Resisting Steels

The Linde Air Products Co., 205 East 42nd St., New York, N. Y., has brought from the press a booklet entitled "Oxwelding Corrosion-Resisting Steels." Recommended practices are given for this application, based on comprehensive investigations of Union Carbide and Carbon Research Laboratories, Inc. The stainless steels are divided into eight groups in the booklet, each group having similar welding properties. Welding procedures for each are discussed in the booklet, which is available on application to Linde Air Products Co.

English Manufacturers Under Merco Patents Visit American Factories

R. W. Leach, chairman of the board of the Audley Engineering Co., Ltd., Newport, Shropshire, England, recently arrived in America to join his son, Kenneth M. Leach, who has been in the United States for the past three months visiting the factories of the Merco Nordstrom Valve Co. and the Pittsburgh Equitable Meter Co.

The Audley Engineering Co., Ltd., is affiliated with the Merco Nordstrom Valve Co. and is licensed under the Nordstrom patents to manufacture "Audco" lubricated plug valves for Europe and Asia. Messrs. Leach showed great interest in American methods of manufacture and contemplate the additions of several items to their present Audco line.



Kenneth M. Leach (left) and R. W. Leach, of Audley Engineering Co., Ltd., Newport, Shropshire, England, photographed at Pittsburgh, Pa.

DIRECTORY

Byllesby Engineering and Management Corporation

Wholly-owned subsidiary of Standard Gas and Electric Company

231 South La Salle Street, Chicago
New York Pittsburgh San Francisco

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MODERN HORIZONTAL BORING MACHINE
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SHEER 31-A MOTOR GAS VALVE
Now Entering Its Third Year
LEADS IN PERFORMANCE AND LOW PRICES
Also Hi-Lo Gas Valve, Step-Opening Gas Valve, Thermostats, Safety Pilots, Limit Controls, Space Heater Regulators, Humidifiers, Etc. . . . .
WRITE FOR CATALOG
H. M. SHEER CO., QUINCY, ILL.

WESTERN GAS
Equipment Information Dept.,
810 So. Spring St., Los Angeles, Calif.

Please advise where I can secure data and prices on the following (equipment or appliance) for use in the gas or liquefied petroleum gas industry.

. . . . . .

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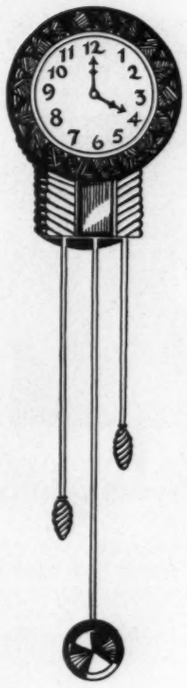
Company. . . . . .

By. . . . . .

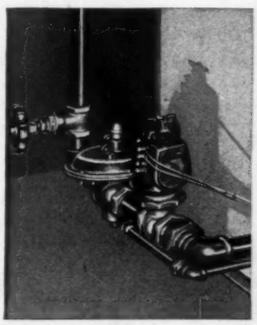
Address. . . . . .

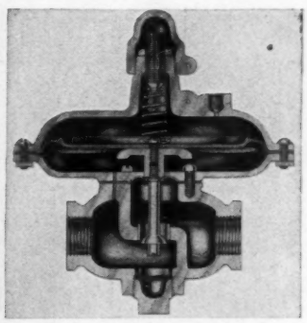


'ROUND THE CLOCK AGAIN AND AGAIN

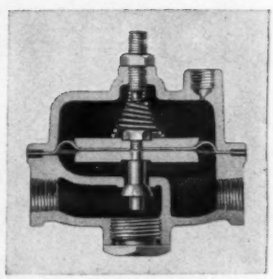
Reynolds Guarantees Unexcelled Performance

REYNOLDS Low Pressure Regulators guarantee unvarying delivery pressures, sharp response to changing load demands and positive control of small volume, low pressure gas flow at outlet even though inlet pressure and volume vary. As is true of all REYNOLDS Regulators, these units are rugged, built of quality materials, and balanced to give more than the maximum through a wide range of operating conditions. REYNOLDS offer complete, co-operative service of their Engineering Department in working out Gas Control problems. Write for details.





Above—actual installation of Reynolds Furnace Regulator. *Directly opposite*—Cross-sectional view of Regulator.



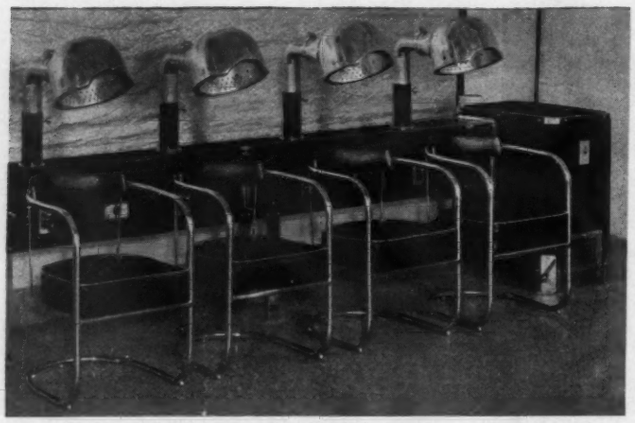
Above—Cross-sectional view of New Reynolds Refrigeration Regulator. *Note* simplicity of construction, ruggedness and fool-proof design.

Reynolds Branch Offices:
421 Dwight Bldg.
Kansas City, Missouri
2nd Unit, Sante Fe Bldg.
Dallas, Texas

Representatives:
Eastern Appliance Co.
Boston, Mass.
F. E. Newberry
Avon, New Jersey
G. H. Unkefer
428 Boyd St.
Los Angeles, Calif.

REYNOLDS GAS REGULATOR CO.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892



Bank of drying helmets, Unitair system, using gas fuel. Units are finished in highly polished black lacquer with chromium plated fittings.

Gas-Fired Hair-Drying System Improvements

Unit Air Corp. of New York City has announced a number of improvements in its Unitair gas and electric hair-drying system, designed for use in beauty salons, clubs, plunges, etc.

The system is fully insulated; drying helmets are adjustable to the individual; a convenient outlet is located in each section for manicure lamp or other electrical appliance. Units are available in 4, 6, 8, 10 and 12 outlets, each dryer outlet being separate in itself, yet supplied with warm air from the same central gas installation. Each outlet is individually controlled. A feature of the equipment is thermostatic heat control and automatic safety pilot which cuts off gas flow if pilot light is extinguished.

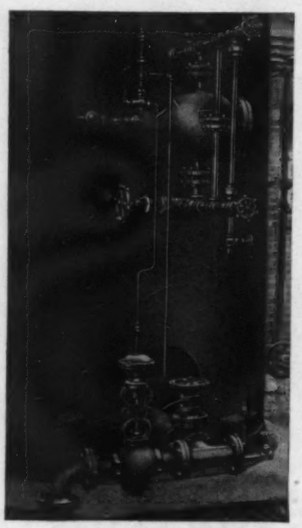
Descriptive literature may be obtained by addressing the Howe Co., Inc., of California, distributors for Unit Air Corp. at 728 Hill Street, Los Angeles.

Renews Franchises

The Oklahoma Natural Gas Co., Oklahoma City, Okla., has renewed franchises in Broken Arrow, Coweta, and Porter, Okla., through special elections held June 12. The franchises are for a period of 25 years and carry a franchise tax of 2 per cent on the residential and commercial sales.

FULTON
Vigilant
V-PORT VALVE

For Continuous Flow



FOR continuous or intermittent flow to or from a tower, tank, or still, under any load, on inlet or outlet as the case may be, the Vigilant V-Port Valve will maintain a correct liquid level at all times. This device, used in the Vigilant Liquid Level Regulator, assures free throttling action. Adapted for temperatures up to 800 degrees F.

There is a C-F regulator for every requirement of pressure control. Write for Catalog.

CF

The Chaplin-Fulton Manufacturing Co.

28-40 Penn Avenue **Pittsburgh, Pa.**

G. W. Harr Appointed President Pennsylvania Nat. Gas Men's Ass'n

G. W. HARR, manager of the gas department of the Monongahela-West Penn Public Service Co., Fairmont, W. Va., has been appointed to succeed F. F. Schauer, vice-president of the Equitable Gas Co., Pittsburgh, Pa., as president of the Pennsylvania Natural Gas Men's Association.

H. H. Phillips, secretary of the T. W. Phillips Gas and Oil Co., Butler, Pa., was elected vice-president, and B. H. Smyers, Jr., attorney for the Equitable Gas Co., was re-elected secretary and treasurer.

Directors in addition to the above are: T. B. Gregory, vice-president, Columbia Gas and Electric Co.; S. W. Meals, president, Carnegie Natural Gas Co.; B. D. Phillips, vice-president, T. W. Phillips Gas & Oil Co.; F. R. Phillips, president, The Philadelphia Co.; George W. Ratcliffe, president, Manufacturers Light & Heat Co.; J. French Robinson, vice-president, Peoples Natural Gas Co.; F. F. Schauer, vice-president, Equitable Gas Co.; J. B. Tonkin, president, Peoples Natural Gas Co.; George E. Welker, president, United Natural Gas Co.; and George Wittmer, Jr., treasurer, American Natural Gas Co.

D. W. Hayes Elected Head of Michigan Gas Association

ALBERT G. SCHROEDER, secretary-treasurer of the Michigan Gas Association, reports a large attendance at the Michigan Gas Association annual convention, held jointly with the Michigan Electric Light Association, June 19 and 20, at Grand Rapids.

Daniel W. Hayes of The Detroit Edison Co., Port Huron, was elected president of the Association for the coming year; David H. Frazer, Jr., Battle Creek Gas Co., vice-president; and Albert G. Schroeder was re-elected secretary-treasurer.

Papers presented at the convention included "The National Utility Outlook," by Alexander Forward, managing director of the American Gas Association; "The Tennessee Valley Situation," Frank A. Newton; "Natural Gas in Michigan," Arthur W. Stace, director, Utilities Information Bureau of Michigan; "The Coke Situation," Howard Pett, Consumers Power Co., Lansing, Mich.; and "Building a Natural Gas Space Heating Load in Michigan," by H. C. Haroldson. Commonwealth and Southern Corp., New York, N. Y.

The convention program also included progress reports by D. E. Herringshaw and Geo. E. Ludwig, on "Oil Gas as a Substitute for Natural Gas" and "Control of Gum Deposits," respectively.

Southern Counties Sales Ahead Of 1933 by 75 Per Cent

Southern Counties Gas Co., Los Angeles, Calif., had its peak month in sale of Electrolux gas refrigerators in May, when 288 units were signed up by the company's sales force. Clyde H. Potter, commercial manager for the company, reports that sales are proceeding very satisfactorily throughout the territory, the company being 75 per cent ahead of 1933 in dollar sales at the end of May.

Mrs. Modern . . . AND

NATIONAL ADVERTISING

● Mrs. Modern reads national advertising with her *mind open* and her *guard down*, realizing that the most fruitful place to find new ideas and modern trends is in the advertising columns of the national magazines.

The result is that she has her impressions formed of a product before she goes into the store to look at it. In many cases this impression is so strongly favorable that little or no selling is required by the retailer.

That this is true in the case of Magic Chef national advertising is proved by many records in our files. We have reports from Magic Chef dealers all over the country of gas range sales made directly as the result of national magazine advertising. . .

For 15 years American Stove Company through national advertising has met the eye of Mrs. Modern with its message of advanced cooking methods and its appeal for better appreciation of the advantages of cooking with gas. That she has accepted the message with confidence and approval is no less a tribute to her intelligence than a test of the overwhelming power of uninterrupted national advertising for half a generation.

This national advertising not only has helped or directly made sales year after year during this period for the benefit of the retailer, but in its influence toward protecting the cooking load, it has immeasurably benefited the whole industry.

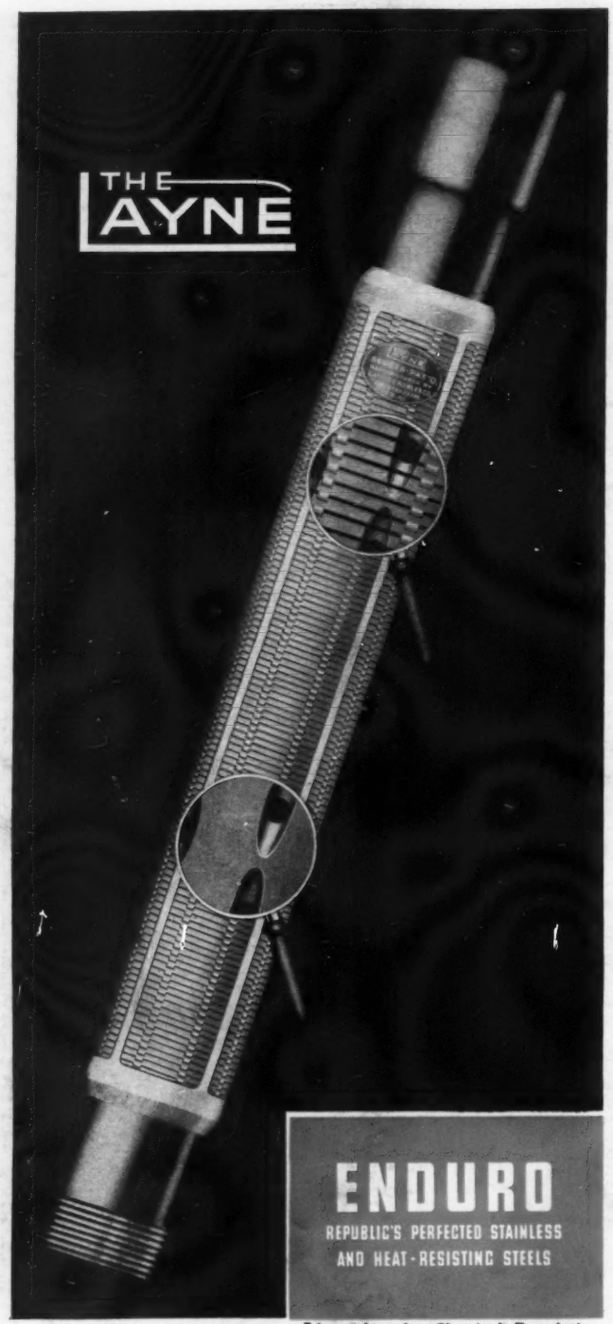
If you haven't seen the Magic Chef Portfolio for Spring, write for a copy.

(*Look for this Trade Mark*)
Magic Chef
AMERICAN STOVE COMPANY

AMERICAN STOVE COMPANY

WORLD'S LARGEST MANUFACTURER OF GAS RANGES

BOSTON • NEW YORK • ATLANTA • CLEVELAND • CHICAGO • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO • LOS ANGELES • SEATTLE



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INTRODUCES A NEW STANDARD OF STRAINER PERFORMANCE

Through the use of ENDURO strainer wire, Layne and Bowler Co., Houston, Texas, has at last overcome that most common and expensive cause of strainer trouble—corrosion—and with the backing of Republic Steel Corporation can now say to operators in every territory—"Here's a strainer wire that will not corrode—even where salt and acid conditions are severe."

ENDURO is Republic's Perfected Stainless Steel—steel alloyed with chromium, nickel and other elements that combine to make it a truly noble metal. It is much stronger than ordinary steel. It is the same composition all the way through. It does not rust or corrode. Salt has no effect upon it. Acid cleaning does not affect it. The life of the metal should equal the life of the well in which the strainer is used.

ENDURO has found a host of other applications in the oil industry—in handling acid sludge—in fittings and valves—in pump parts and in many parts of the modern refinery equipment that is fast making obsolete the old.

Write for complete descriptive literature.

CENTRAL ALLOY DIVISION . . MASSILLON, OHIO

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GENERAL OFFICES YOUNGSTOWN, OHIO